Proceedings of the Integrated Pest Management Communications Workshop: Eastern/Southern Africa

March 1-6, 1998, Nairobi, Kenya

International Centre for Insect Physiology and Ecology (ICIPE)

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Introduction

Integrated Pest Management (IPM) plays a crucial role in traditional farming systems and sustainable agricultural development. It is a knowledge-based system which by definition requires readily available, site-specific, informational resources for its successful implementation. The historical contribution of IPM in Africa has been enormous in the traditional sector, but has had limited impact in raising agricultural productivity in all sectors. One of the most limiting factors to agricultural productivity increases is access to IPM knowledge.

Various forms of information dissemination exist within Africa, from conventional, national extension programs, to innovative local initiatives. Within recent years there has been a rapid increase in the availability of electronic communication. Each of these areas has a contribution to make, but at present efforts are disparate, severely reducing their potential for impact.

Purpose and Objectives

The Purpose of the workshop is to:

- Explore ways electronic communication can be integrated into existing patterns of communication within Africa, and
- Take advantage of the new opportunities afforded by advances in communications technology

Objectives:

- Identify the information needs of IPM practioners and transfer intermediaries;
- Explore both the potential and the limitations of electronic communication technologies as applied to IPM problem solving, transfer and use;
- Identify existing IPM-relevant networking initiatives in sub-Saharan Africa and potential links between them and others;
- Identify and enhance networking opportunities for IPM and improved information sharing among IPM practioners and transfer intermediaries in the context of sustainable agriculture initiatives within the region;
- Promote interaction and idea exchange among information and telematics specialists and key players involved in IPM research, extension and implementation, including national and international programs, NGOs, and commercial private sector (such as fresh produce exporters and outgrower associations).

Workshop Outputs:

- Jointly conceived regionally- and nationally-relevant strategies, frameworks, plans of action and follow-up mechanisms for IPM information sharing and dissemination in eastern and southern Africa.
- Recommendations on approaches to improving networking, information content, information partnerships, and appropriate media over the next five years.

Organizing Partners:

The IPM Information Partnership (CAB International, CICP, CGIAR SP-IPM, IPM-Europe, IPM-Forum, USAID's IPM CRSP/Africa IPM Link; CTA, ICIPE; ICRAF; and USAID Bureau for Africa (Africa Link and Leland Initiative), in collaboration with regionally-based NGOs such as CARE, and the African regional agricultural research fora.

URLs for these Partners follow:

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IPMEurope http://www.nri.org/IPMEurope/homepage.htm
CICP http://www.IPMnet.org/
CTA http://www.cta.nl/
SP-IPM http://www.cgiar.org/spipm/
ICRAF http://www.cgiar.org/ICRAF/Index.htm
CABI http://www.cabi.org/
ICIPE http://www.icipe.org/
USAID http://www.info.usaid.gov/regions/afr/
IPM CRSP http://www.cals.vt.edu/ipmcrsp/index.html
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ACRONYMS AND DEFINITIONS

| A to D | E to I | K to Z |

Acacia	Initially launched by Canada's International Development Research Centre (IDRC), the Acacia Initiative is an international effort to empower sub-Saharan African communities with the ability to apply information and communication technologies to their own social and economic development.
ACP	Africa, Caribbean and Pacific
ADB	African Development Bank
AELGA	African Emergency Locust and Grasshopper Assistance (USAID Project
AFRENA	Agroforestry Research Network in Africa East and Central
AFRNET	Feed Resources Research Network
AGRICOLA	Agricultural On-line Abstracts
AGRIS	Agricultural Research Information System
AGRITEX	Developmental Agriculture and Extension Service (Zimbabwe)
AHI	African Highlands Initiative
AISI	African Information Society Initiative
ANAFE	Agroforestry Education
APC	Association Pro. Communication
ARC	Agricultural Research Council (South Africa)
ARIS	Agricultural Research Information Service (Uganda)
ASARECA	Association for Strengthening Agricultural Research in East and Central Africa
BARNESA	Banana Research Network for East and Southern Africa
BC	Biological Control
BICG	BioNet International Consultation Group
CABI	Centre for Agriculture and Biodiversity International
CARDI	Caribbean Agricultural Research and Development Institute
CARE	Global NGO
CARNET	Cattle Research Network

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CD-ROM	Compact Disc-Read Only Memory
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CIAT	Centro Internacional De Agricultura Tropical
CICP	Consortium for International Crop Protection
CIDA	Canadian International Development Agency
CIIFAD	Cornell International Institute for Food and Agricultural Development
CIP	Centro International de la Papa (Int. Potato Inst., Peru)
CIPM	Center for Integrated Pest Management
CIRAD	Centre de coopération internationale en recherche agronomique pour le développement
CORAF	Conférence des responsables de la recherche agronomique africains
CRDA	Christian Relief and Development Association
CRS	Catholic Relief Services
CTA	Technical Centre for Agricultural and Rural Cooperation
CURE	Coordination Unit on Rehabilitation of the Environment
DFID	Department for International Development (UK)
DIR	Database of IPM Resources
EARO	Ethiopian Agricultural Research Organization
EARRNET	East African Rootcrops Network
ECA	Economic Communications in Africa
ECABREN	Eastern and Central Africa Bean Research Network
ECAPAPA	Eastern and Central Africa Program for Agricultural Policy Analysis
ECOWAS	Economic Community of West African States
ERO	Ethiopian Research Organization
ESCaPP	Ecologically Sustainable Cassava Plant Protection
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FIDONET	Non-commercial, volunteer network of computer systems
FPEAK	Fresh Produce Export Association of Kenya
GCPF	Global Crop Protection Federation
GIPMF	Global IPM Facility
GPPIS	Global Plant Protection Information System
GTZ	Gesellschaft für Technische Zusammenarbeit GmbH (Germany)
IARC	International Agricultural Research Centre
ICIPE	International Centre for Insect Physiology and Ecology
ICOM	International Council of Museums
ICRAF	International Centre for Research in Agroforestry
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICT	Information and Communication Technology
ICWESA	IPM Communications Workshop: Eastern and Southern Africa
IDEA	Investment in Developing Export Agriculture
IDRC	International Development Research Centre (Canada)
IIBC	International Institute for Biological Control

IIRR	International Institute for Rural Reconstruction
IISD	International Institute for Sustainable Development
IITA	International Institute for Tropical Agriculture
INIA	National Directorate of Culture (Mozambique)
INRA	Institut national de la recherche agronomique (France)
INSAH	Institut du Sahel
IPM	Integrated Pest Management
IPM CRSP	IPM Collaborative Research Support Program
IPPC	Integrated Plant Protection Center
IPPM	Integrated Production and Pest Management
IRAD	International Research for Animal Development
IRLCO	International Red Locust Control Organization
ISNAR	International Service for National Agricultural Research (The Netherlands)
ISP	Internet Service Provider
IUFRO	International Union of Forestry Research Organizations
KADOC	Kenya Agricultural Documentation and Information Centre
KAFRI	Kenya Forest Health Centre
KARD	Kenya Agricultural Research Database
KARI	Kenya Agricultural Research Institute
LAN	Local Area Network
MOA	Ministry of Agriculture
NAPREECA	Natural Products Research Network for East and Central Africa
NARO	National Agricultural Research Organization (Uganda)
NARS	National Agricultural Research Systems
NATURA	Network of European Agricultural (Tropically and Subtropically Oriented) Universities and Scientific Complexes Related with Agricultural Development
NGO	Non-Governmental Organization
NIPMN	National IPM Network (U.S.)
NIRS	National Irrigation Research Station (Zambia)
NRI	Natural Resources Institute (UK)
NSF	National Science Foundation
OAU	Organization for African Unity
OECD	Organization for Economic Cooperation and Development
ORSTOM	Institut de recherche pour le développement en coopération (France)
PADIS	Pan African Development Information System
PAN	Pesticide Action Network
PASCON	Pan African Striga Control Network
PC	Personal Computer
PFARD	Peasant Farmers Association for Rural Development (Uganda)
POP	Point of Presence
PPRI	Plant Protection Research Institute
PRAPACE	Regional Potato and Sweet Potato Improvement Program (E & S Africa)
PTC	Postal Telephone and Communications
PVO	Private Volunteer Organization

R&D	Research and Development
SAAINET	Southern Africa Agricultural Information Network
SACCAR	Southern African Centre for Cooperation in Agricultural and Natural Resources Research and Training
SADC	Southern African Development Community
SAFRINET	Southern Africa Network
SAMP	Swedish African Museum Programme
SANGONET	Southern Africa NGO Network
SPAAR	Special Program for African Agricultural Research (USA)
SP-IPM	CGIAR system-wide Program for IPM
SSA	SUB SAHARAN AFRICA
UNESCO	United Nations Education, Scientific and Cultural Organization
URL	Universal Resource Locator
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
WARDA	West African Rice Development Association
WWW	World Wide Web
ZEGA	Zambian Export Growers Association

| A to D | E to I | K to Z |

Proceedings of the Integrated Pest Management Communications Workshop: Eastern/Southern Africa

March 1-6, 1998, Nairobi, Kenya

International Centre for Insect Physiology and Ecology (ICIPE)

Telematics and Agriculture: The Eastern Africa Experience

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(As Transcribed by G. A.Schaefers)

The outline of my presentation will include: Motivation and Background, Prospects for Telematics, some Requirements and Impediments, and the Status of Telematics in Africa.

The term telematics means many things, but the bottom line is money, economics, i.e. how much does it cost? My figures are old, based on 1993, but they probably haven't changed much. Telematics is a 450 million dollar business. The African share represents only a small portion however.

Telematics comes from the word informatics which means the use of computer networks for information transfer. It includes the broad use of computers and telephones. Today, many technologies have come together. Computers can be used to make a telephone call. They cannot be separated. I think that electronic networking and telematics mean the same thing. The electronic part is the most important. Printed material must be digitized. Although networking is important, digitizing data is perhaps more important, making things easier to search.

We are dealing with three types of technology; terrestrial links, telephone including dial-up, leased lines, and specialized, faxes and telexes; wireless media including cellular phones, pagers, satellite, radio, packet radio, and broadcasting; and media independent services. The Internet is media independent. It can be accessed with any of these. Media independent includes ordinary E-mail which can be one to one or one to many, fax via E-mail., video-conferencing (perhaps not well developed in Africa), and Internet phone.

In reviewing the trends in telematics, computers are becoming cheaper, more powerful, and more widely available. Telecommunications are advancing rapidly with a merging of Telecoms and IT.

Advantages of the technology. Traditional faxing is too expensive. E-mail, on the other hand, costs less than 20 cents to send a page overseas, and it is speedy and convenient. It promotes research/collaboration. Journals are three to four months old in most African Libraries. With computers you can access up-to-date libraries. The technology makes the world smaller. You can be anywhere in the world, it becomes irrelevant.

Public domain software. Much can be obtained for free through the Internet. In terms of background we have AfyaNet, which is a Swahili word for health, thus HealthNet. A doctor can obtain information on a medical problem. He can get documents on treatment from anywhere in the world. It offers great opportunities in medicine.

AGRONET/KARINET Services:

Forum for Sharing Agricultural Information
Electronic Conference for Agriculturists
Access to Emerging IT's, esp. Networking
Network Access to the "Computerless"

Access to other Local, Regional and Global Conferences.

What are the requirements for telematics? These include infrastructure, motivation/championship, management support, Government policy and support, expertise and human resources, planning and management, maintainability and sustainability, equipment and software, and a critical mass of users.

What are the challenges and problems? Technological slavery means once you try it you become hooked on it. Security is not assured. Passwords do help but can be tracked. Why is it not more widespread in Africa? Some are concerned with National Security. Too few people are using it. Additional challenges include sustainability and the problem of wrong technological choices. Problems include little sensitization, opportunism (commercial lust, monopoly, self gratification and cheap talk), limited resources (phone bills, equipment and software, personnel training, incidentals), and over-sensitivity.

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International Centre for Insect Physiology and Ecology (ICIPE)

Challenges to Develop and Implement IPM in Sub-Saharan Africa

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The annual world population increase over the next 50 years is estimated at 100 million people of which 97 percent live in the developing world.

For these people extra food has to be produced. However, the possibilities to expand agricultural lands are limited.

Therefore, 75 percent of this food should be derived from higher yields per unit area. One of the possibilities to obtain higher yields is by combating pests, diseases, and weeds, which cause about 40 percent crop loss before harvest, and another 10 to 30 percent after harvest.

Crop losses can be prevented or reduced by implementing one of the following control strategies:

- Host plant resistance: the use of crop varieties that resist pest attack.
- Biological control: the use of living organisms to control pests by three methods: (1) introduction (classical approach), (2) By releasing (inoculation and inundation), and (3) by enhancing their efficacy (conservation technique).
- Cultural control: modification of cropping practices to make crops less favorable for pest development and survival.
- Chemical control: the use of toxic substances to kill pests.
- Mechanical and physical control: direct destruction of pests.
- Interference methods: disruption of physiological functions or behavior of pests.

Actors Involved in Crop Protection

Farmers are normally responsible for the control of pests, diseases, and weeds at their farms. They are assisted by extension workers giving technical advice, and research scientists developing control options.

Governments of developing countries regularly intervene in crop protection, directly through national chemical control campaigns against widespread pest outbreaks, or indirectly through pesticide subsidies. They intervene particularly in key food crops such as rice in Asia or in export crops such as cotton in Africa. Policy decisions, including quarantine regulations, pesticide registration, and pesticide pricing, are made by specialized national and international institutes such as Plant Protection Services, Ministries of Agriculture, and FAO.

When decisions on pesticide use are made at a national instead of at the farmers' level, the danger is overuse of pesticides and uneconomic decisions. This because control is often based on fear for pest damage and not on risk calculations of actual pest development. Pesticides render

direct clear visual effects, and particularly in export crops are therefore often the first line of defense.

Because in structural adjustment programs subsidies on agricultural inputs including pesticides are reduced, market forces will increasingly determine the economic possibilities for pesticide use. For high-value export crops, this means often a rapid increase in pesticide use, such as with vegetables in Southeast Asia, Central America, and around major cities in Africa. For certain pest and disease problems, pesticides need to be applied because there are no viable alternatives. However, in general, agriculture can do with fewer pesticides, particularly in situations where their use is high. However, in subsistence agriculture, pesticides are hardly used because of the costs involved in their application.

Pesticide Management

Intensive pesticide use has important drawbacks. Pests develop resistance to pesticides, involving also vectors of human diseases such as the mosquitoes transmitting malaria and dengue. Natural enemies, which are vulnerable to pesticides, are destroyed leading to pest resurgence and secondary pest outbreaks. Most farmers do not know how to handle these toxic products leading to human and environmental hazards.

Therefore, pesticides should be judiciously used by selective application of broad spectrum pesticides, or choosing selective pesticides, and by applying only when economic threshold levels are reached. IPM projects have shown that pesticide use can be reduced while maintaining or even increasing yields. National governments and donors have an important role to play in pesticide management issues. e.g. agricultural development programs should only be supported when pesticides are judiciously used; the availability of dangerous pesticides regulated; pesticide subsidies abolished; non-chemical control options in research programs promoted; and pesticide-biased education, training, and extension discouraged.

Evolution of IPM

During the history of IPM, the concept changed from a technical one, reducing pesticide applications and combining different control options, into a methodological one, in which farmers are taught to make better crop protection decisions:

- First generation IPM projects reduced pesticide use by applying them on a need basis (using economic thresholds) and by combining different pest control options such as host plant resistance and biological control.
- Second generation projects took a more holistic approach by linking pest management to the farming system because control recommendations can conflict with other farm operations, leading to low acceptance rates by farmers.
- Third generation IPM projects stressed farmer empowerment and include participatory extension, institutional change, and policy making. Ecological and economic informed decision making by farmers replaced the recommendation of fixed prescriptions. Institutional change became part of IPM because the participatory approach re-examined the role of research and extension by both governmental and non-governmental organizations. Policy making was included because government policies strongly influence pesticide use and possibilities for IPM through price policies, regulations, and investment programs.

Third generation IPM projects not only address sustainable crop protection but also all other factors associated with crop health, such as poor soil fertility and poor water management. Crop health and vulnerability to pest and diseases are ultimately related. Therefore, the concept of Integrated Crop Management has been proposed. Even such an approach may be considered to be too restricted, particularly when taking into account the role of livestock and agroforestry in solving soil fertility problems, or the role of banking and marketing in solving the cash and market problems of the farmer.

IPM in Different Cropping Situations

It is a misconception that IPM is a technical blueprint to solve pest, disease, and weed problems. Because of the wide range of agro-ecological and socio-economic conditions under which crops are grown in the different continents, site-specific solutions are required. However, IPM as described in third generation projects is a very effective methodology to develop site-specific solutions. How different solutions may be will be illustrated by referring to the IPM experience in three different cropping situations: irrigated rice, vegetables, and food crops.

The regional FAO IPM rice program in South and Southeast Asia has been successful, particularly with respect to the training methods used: Training of Trainers and Farmer Field Schools. A number of elements have contributed to this success. Irrigated rice is a native, long established crop in Southeast Asia that harbors a large number of beneficials, which keep pest species under effective natural biological control when left undisturbed. The program came into being as a response to a crisis situation because of pest resurgence and secondary pest outbreaks, mainly the brown plant hopper, which had been brought about by decimation of the potential of natural biological control through abuse and overuse of chemical pesticides in the wake of the green revolution. At the root of the crisis was not lack of research information but failure of using available knowledge on induced outbreaks in training farmers and changing crop protection policies. Demonstration of beneficial action of predators and parasitoids proved to be an eye-opener for most farmers, providing a strong impetus to their acceptance of the participatory training method.

In comparison, many vegetables grown in Asia and Africa are not indigenous. Consequently, complexes of indigenous natural enemies exerting natural biological control are less developed than in co-evolved agro-ecosystems. Protection often leans heavily on chemical control. Pesticides, mostly insecticides but also fungicides, are usually applied to the calendar and often much more frequently than is really necessary. However, this does not mean that treatments with pesticides can be halted altogether. The strategy of chemical non-intervention clearly has a more limited applicability in vegetables than in rice. Therefore, cultural control methods such as crop rotation and intercropping and the use of resistant varieties should be more strongly part and parcel of IPM training in vegetables than in rice. Furthermore the lack of non-chemical control options implies that research should be much more involved in the development of vegetable IPM programs. Other issues as marketing are also more important for vegetables than for rice, because the crops are perishable, with a relatively unstable price and no fixed marketing channels. The difference

between IPM in vegetables compared to rice is "ecological informed non-intervention" versus "ecological and economic informed intervention."

Food crops in sub-Saharan Africa are mostly produced on small holdings of less than two hectares under a wide range of agro-ecological conditions. Resource poor farmers grow a variety of these crops with traditional techniques and do not apply pesticides. Crops are not only subject to risks of pests, diseases, and weeds but also to those related to erratic rainfall, soil erosion, and nutrient depletion. In IPM extension, difficult decisions have to be made: how to select farmers in groups taking into consideration farmer categorization (how much heterogeneity) and gender, should one or more crops be the focus, to what extent should other problems than crop protection be addressed, how and what kind of curriculum should be developed if the farmer field school approach is adopted, how much emphasis should be given to the provision of information and how much on own experimentation?

In Africa, the Farmer Field School approach has a better chance to succeed in cash crops like vegetables than in subsistence food crops. The approach for subsistence crops should also be different giving more emphasis in the curriculum on integrated crop, water, and soil management. Research should specifically be involved to provide information relevant to the problems of both research-poor farmers and commercial farmers. For cash crops the industry should also be involved.

Constraints and Opportunities in IPM

Different factors are limiting IPM progress in developing countries: weak and top-down operating extension and research systems; lack of sufficient information on the biology, ecology, and control of pests, diseases, and weeds; weak linkages between research, extension, and farmers; pesticide biased governmental institutions; price policies promoting pesticide use; poor legislation and control governing pesticide registration and use; and lack of instruments to enforce legislation. To effectively address such a variety of constraints, the design of IPM projects should receive much more attention than in the past.

On the other hand there are good opportunities for IPM in developing countries, often better than in developed countries. The low rate of pesticide use in traditional food crops allows maximal exploitation of naturally and introduced biological control organisms. Most farmers consider pesticides relatively expensive and will therefore be motivated to reduce chemical control. Vested interests in the developing world in chemical control are still limited, which is advantageous for the introduction of non-chemical control options. Quality demands in these countries for basic food crops are also low, increasing the chances for IPM, because some damage can be tolerated. This in contrast to developed countries where 95 percent of the pesticides are used to control the final five percent cosmetic damage. For these reasons, governments assisted by development banks and bilateral donors should incorporate IPM in agricultural intensification programmes, making an implicit choice for low input, non-chemical control options.

IPM Project Design

Because of the emphasis in IPM on the holistic approach and farmer empowerment, IPM project design needs particular attention. IPM knowledge systems need to be analyzed to define work plans indicating necessary linkages and labor division between IPM related organisations such as Ministries, Plant Protection Service, NARS, Universities, NGOs, peoples organizations, and pesticide companies.

Local stakeholders should be involved to obtain sustainability: use of local farmer/indigenous knowledge, involvement of multi-disciplinary teams for problem solving, integrated solutions for farm communities including health, food security and environment, and the creation of funding sources to make customers pay for the services of governmental and non-governmental organizations.

IPM should be linked to macro level policies. IPM projects are good instruments to translate policy decisions such as liberalization, decentralization, and privatization into operational realities in the field. Market forces should be considered in project design to promote IPM. For example, IPM projects should work on relevant crops, consider the transformation of extension into a client driven activity, develop simple pest control methods that can be used by farmers, and introduce non-chemical control to replace pesticides, which, because of disappearing subsidies, become more and more expensive. To this purpose, economic policy considerations and market analysis should be integral components of IPM project design. For the purpose of coordinating all these activities, national IPM committees have been created in a number of countries.

IPM Information and Documentation

One major constraint of developing and implementing IPM is the lack of technical and methodological information. Documentation centers are poorly equipped, meaning that specific scientific and technical information, and exchange of IPM experience are difficult and costly to obtain. Therefore, it should be investigated how to facilitate literature searches, exchange of literature (in particular non-conventional), publication of bibliographies on IPM relevant material, document delivery, query-answer services, editing of a newsletter, liaison function (bringing IPM workers into contact with each other), and exchange of IPM experiences.

Many groups are concerned with IPM: farmers, extension workers, scientists, national policy makers, and officials of donor and international organizations. They all need to make judgements about IPM and how it fits into their agenda, and therefore need to have information or knowledge about the potential and benefits of IPM:

- *Farmers*: improved decision making to control pests using IPM methods, reduced dependence on external inputs including pesticides, higher income, increased yield stability, reduced health risks, reduced degradation of natural resources, increased use of resistant varieties, recognition of natural enemies, and increased use of pest scouting procedures for selective chemical control.
- Exte*nsion officers and research scientists*: farmers need a variety of pest management solutions on different IPM components to respond to a very wide range of conditions; site-specific solutions are needed, requiring a new methodology to develop them; IPM methodologies

are currently being developed requiring an interchange of IPM pilot project experiences within Africa.

- *Consumers*: reduced pesticide residues on produce, reduced exposure of rural population to pesticides, to aerial applications, and to polluted drinking water.
- *Society (government):* reduced degradation of natural resources (expressed in contamination levels in ground and surface water and in soil, soil microbiota, and degree of soil erosion), reduced health care costs, improved health condition of the population, reduced expenditures on pesticide subsidies, saving foreign exchange, and new business opportunities arising from a cleaner environment, such as fish production.
- *Commerce*: diversification in small scale business (production of biological control agents, scouting teams), improved export potential of produce because of acceptable levels of pesticide residues (measured by volume of produce rejected due to residues).
- *Environment*: preservation of biophysical resources (e.g. by population counts of natural enemies) and improved water and air quality.

Improved access to technical information and extension and training material in IPM, as well as a better interchange of experiences in IPM methodology should facilitate the development of sustainable crop protection in Africa. Modern communication techniques are rapidly taking momentum in the developing world. Their use in the dissemination of IPM technology and methodology information should be maximally exploited.

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International Centre for Insect Physiology and Ecology (ICIPE)

An Integrated Information and Communication Perspective for Agricultural and Rural Development in Eastern Africa

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Introduction

Access to and availability of information is a vital resource to support agricultural development and is a prerequisite to agricultural production.

The farmer needs information relating to production technology that involves cultivation, fertilizing, pest control, weeding, harvesting; markets, and market forces. The extensionist uses information to arrive at appropriate extension strategies. The researcher requires information relating to technological innovations while the manager and policy maker require information on which to base their decisions. The supply of information to the various categories will depend on:

- Knowing what is known (abstracts journals, bibliographies, catalogues, databases, and CD-ROMs;
- knowing where to locate detailed information (library services, catalogue,s and unified lists);
- restructuring information in a form suitable for dissemination (repackaging), and
- using effective lines of communication (E-mail, wide area networks, etc)

Experience demonstrates that in the Eastern and Central region, the present situation is far from satisfactory in many of these respects. This paper presents current experience with regard to attempts to conceive a Regional Agricultural Information Network (RAIN) to manage the scientific information and highlights areas that have the potential to make successful use of new Information Technology.

Limitations to Effective Utilization of the Information Technology

In our effort to streamline information structure and to plan to manage scientific information, including setting up databases organized as a PC-based LAN consisting of one 1GB fileserver and five stations, experience demonstrated that there were factors that constantly constrained the availability and management of scientific information in the Eastern and Central Africa region. These factors included the following:

- Weak and ineffective information structures;
- lack of or insufficient resources in the form of human, financial, and technological forms to implement activities as planned;
- poor coordination and utilization of information resources;
- lack of appropriately trained/skilled manpower; and
- ineffective organizational structures that hamper efficient information management and utilization.

At both national and regional levels, surveys demonstrated that there were:

- poor coordination of access to and utilization of existing sources of information,
- poor linkages between existing structures and source of information, and
- lack of/poor national and intra-regional communication are major constraints that do not encourage information exchange.

Needs Addressed

The Fourth Lome Convention conferred on the CTA the mandate to assist ACP countries in Scientific and Technical Information. Emphasis was laid in developing capabilities in NARS by ACP countries in information production, acquisition, processing, and dissemination. CTA thus worked with ACP countries and evaluated their information needs and monographs were prepared in 1993 on the status of agricultural information in the Eastern Africa, and Indian Ocean countries.

A synthesis of Agricultural Information Needs of the Eastern and Central Africa countries was produced in July 1993, and this was reviewed at a workshop in Seychelles in December 1993. During this workshop, four main areas were identified for emphasis: Research Information including IPM technologies; Extension Information, including IPM extension information; Human Resources Development; and Publications. At the same time, National and Regional Information Focal Points were also identified.

In Mauritius in December 1994, possible information programs were proposed to cover Extension Information, Library and Documentation, Information Management and Technology, Publications, and Human Resources Development. In all the above domains IPM information was included. These broad thematic areas were later to be reviewed and a comprehensive program was conceived following these identified areas.

Regional Agricultural Information Network (RAIN)

An Integrated Information Program has thus been conceived, to link all ASARECA countries. Components of this Network include the following:

- Information Management and Technology,
- Library and Information Services,
- Extension Services, and
- Publications.

Each of the above thematic areas would include IPM for communication to the relevant clients. Human resource development is built into each sub-programs. Each National Information Focal Point would set up activities under each sub-program. The National Information Focal Points would be linked to the Regional Information Focal Point to facilitate sharing of resources. To be able to share resources in the ASARECA countries and to share IPM technologies, the following five projects are under consideration for funding.

Project No. 1

A Mechanism for Information Management and Technology Enhancement

Specific Objectives

- Link electronically all National and Regional Agricultural Information Focal Points into a Regional Agricultural Information Network (RAIN).
- Harmonize systems of identification, collection and processing of agricultural information (database creation), and dissemination of same.
- Promote training in CD-ROM production, database use, E-mail communication.

Activities

- Collect and organize agricultural information materials into national and regional databases,
- Abstract, index and process collected information,
- Edit databases,
- Link selected national libraries with Sub-regional Focal points.

Project No. 2

Union Catalogue of Serials in Agricultural Libraries

Main Objectives

- Facilitate journal acquisition — regional cooperation,
- Facilitate resource sharing of existing sources of information,

- Enhance better document delivery.

Activities

- Compile information at national level in one location in each country All NAIFPs.
- Merge national databases to establish regional database — RAIFP.
- Printing and publishing of regional catalogue — RAIFP.

Project No. 3

East Africa Literature Service

Main Purpose

- Provide researchers with access to the current literature available/accessible in the region

Main Objectives

- Document the resources available in each country.
- Identify in which areas the libraries can share the literature available.
- Enhance document delivery.

Activities

- Identify libraries that will participate in the project,
- Identify contact persons in the countries,
- Identify coordinating agency to monitor project,
- Assess the existing facilities (equipment, human resources) in each country,
- Train persons to be assigned to the project in each country
- Provide the necessary or supplementary equipment to allow each country to participate in the project,
- Develop guidelines for the current contents service,
- National coordinating agencies to collect the information locally,
- Dispatch information to regional coordinating agency,
- Circulate lists to the countries in project,
- Provide each participating library document delivery services, and
- Monitor and feedback of project

Project No. 4

Strengthening Agricultural Extension

The Problem

- Lack of effective mechanisms for dissemination of research findings to end users,
- Lack of effective mechanisms for repackaging research findings,
- Strengths and weaknesses of diverse extension techniques not well understood, and
- Non-incorporation of indigenous knowledge into extension packages.

Objective

- To facilitate overall agricultural and rural development through enhanced farmer-know how

Project Purpose

To improve farmers access to information through interactive communication between research, extension and farming communities

Specific Objectives

- Evaluate the diverse extension methodologies,
- Promote repackaging of documents into forms that can be disseminated to farmers,
- Promote regional training,
- Establish a record of extension documents (films, videos, etc),
- Recommend appropriate methods for technology transfer,
- Promote publications of popular literature and advisory articles.

Activities

- Survey of extension methodologies,
- Identify agricultural production indigenous knowledge and incorporate it into extension messages,
- Establish a central record for extension documents, films, etc in order to facilitate sharing, and
- Initiate publications of advisory articles

Implementation

The National Agricultural Information Focal Points may sub-contract other institutions to implement

Expected Outputs

- Documented extension methodologies,
- Analysis of extension approaches,
- Centralized information bank to facilitate sharing,
- Enhanced dissemination of extension messages, and
- Improved approaches through incorporation of indigenous knowledge.

Project No. 5

Improving and Diversifying Information Outlets

Problem

- Scientific avenues are weak
- Discourage scientists
- Irregularly published journals

Objectives

- To enhance information availability through diversification and improvement of outlets
- Provide training in:
    - scientific writing
    - scientific editing
    - desk-top publishing
    - effective production of annual reports and other publications
- Strengthen existing scientific journals through training program.

Activities

- Inventory to assess the needs for training,
- Identify target audiences for diversified publications,
- Develop training materials for information management, scientific writing, editing and communication,
- Initiate a regional newsletter/current awareness/agriculture in news, and
- Facilitate meetings for national and regional professional associations e.g. editors.

Expected Outputs

- Trained manpower,
- Additional scientific outlets, and
- Training materials for scientific writing, editing, publishing, and communication skills.

National and Regional Information Structures

Over the last few years, attempts have, however, been made to conceive a system where all the national structures interested in the information resource can be coordinated in a manner that creates a possibility to enhance national cohesion in information utilization. The idea of National Agricultural Information Focal Point has been put into operation and to date, some NARI's house what can be called rudimentary NAIFP's. In attempts to make the NAIFPs functional, certain criteria that ensures successful implementation and sustainability of the NAIFPs need to be known:

- The National Information Focal Point idea should be based on national participation so that all constituents of the national systems are reinforcing rather than competing,
- Partnership in technical decisions is emphasized in adapting the systems to changing technology and needs and in sharing data gathered,
- Participating institutions should be involved in selecting input data,
- Participating policy centers should have free access to the systems database, with freedom to download what they need for their local database,
- No financial contributions should be imposed on those national institutions wishing to join; and
- The system should aim at strengthening institutional capacities in compatibility with regional/international systems.

Current Experiences and Potential for Use of Modern Information Technology

With increasing competition for scarce resources, greater investment in the efficient use of information including IPM information is now recognized to be important, and extra resources need to be allocated to this activity. Most ASARECA NARI's have made some attempts to get into the mainstream Information Technology arena, which is a new tool for development personnel. While once it would take weeks to prepare and send results of research to other colleagues, it now takes a few moments. The impact of this development is now just a beginning to be felt.

Access to Published Data and Papers World-wide

Access to research published outside the immediate environment has been slow and incomplete, often relying on printed bibliographies, abstracting or indexing services, and periodic reviews of research literature. These have been often fragmented, expensive, and suffered from a considerable time lag between publication of the original paper and its bibliographic listing. In addition, even after identifying suitable references, there was a problem in acquiring photocopies or reprints of the full text. It was not surprising that many researchers in Eastern Africa were forced to rely on incomplete information for developing their research agenda. An example of how this process has been changed by technology can be demonstrated by the Institute of Scientific Information (ISI) in the United States. In the 1960s, ISI began a revolution in current awareness services based upon the development in photocopy technology at that time, which enabled relatively cheap and fast copies to be made of the contents pages of journals. Based on this idea, ISI produced a weekly journal called Current Contents, which enabled scientists to have the contents pages of a wide range of scientific and technical journals on their desks within days of the journal issue being released.

With the wider availability of PCs in the early 1980s, ISI produced a computer diskette version of the same publication, allowing specific searches to be conducted on its content using simple search software, and more detail of papers to be offered to the user in a very lightweight format. Airmailing a diskette is far cheaper than mailing a 50 page journal. This flexible format led to a considerable increase in use of Current Contents.

Today, Current Contents is also available weekly on CD-ROM, which under our program would be received by KARI's Library and Information Services or the NAIFPs. Because of the massive amount of data that can be recorded on a CD, it is now possible to have immediate and up to date access to a full year's coverage of the contents of over 900 journals in agriculture, biology, and environmental science together with informative abstracts. Current Contents is also available online via the Internet, and the full text of any paper listed is accessible using ISI's own online request system or by email request services such as the British Library Document Supply Centre, which we are already using.

Similar developments have taken place with a vast array of abstracting and indexing services including CAB Abstracts and TROPAG, both of which are now available on CD-ROM in some of the ASARECA NARI's.

Access to Local Research Databases

It is one of the anomalies of developing countries that knowledge of and access to local research data is often more difficult to obtain than to materials published in the developed world. Lack of resources and continuity have hampered attempts to keep us up to date with research. Organizations and nations who could collaborate often have different agenda when it comes to sharing information; even within organizations there may be difficulties in sharing or transmitting information. The current program attempts to develop ways to ensure effective recording and disseminating of IPM information and others on ongoing and completed research.

A number of NARI's have attempted to record this information. For example, Kenya Agricultural Research Database (KARD) is an example of a national research database that demonstrates the need for continued effort by scientists and information workers to provide a timely local information resource. The database has been copied to diskette and made available at a number of KARI centers; it is regularly searched by research workers in Kenya and has generated a series of hard copy literature reviews covering specific subject areas. There is the continual problem, common to all databases, of updating and editing the information in KARD, but a long-term aim is to make it more accessible — possibly by making it available over the Internet. Updated information to be added to the database could also be received in the same way.

KARD is a computerized bibliographic database that contains past agricultural research work about Kenya (though not necessarily found in Kenya). The work dates as far back as 1900 to the present. At varying levels of accessibility, the materials documented include both published and "grey" literature. The database is organized on a PC-based LAN consisting of one 1GB fileserver and five work stations. The software selected for use on the LAN for the bibliographic database in Micro CDS/ISIS provided by UNESCO.

The KARD currently holds in excess of 40,000 records most of which are received from the "grey" literature. Collection of the published literature, such as items in the international journals and proceedings of major conferences, has been fairly straight forward. The "grey" literature eg KARI annual reports and ministry reports posed a more complicated problem as its location required the time consuming and physical effort of visiting the libraries and offices where these were expected to be found. Once located, the bibliographic details including abstracts of relevant material were entered onto the database.

The database can now be searched and retrieved based on keywords, discipline, main items/commodity, authors, etc. Searches can be selectively printed or downloaded. The unit is now in the process of producing comprehensive reviews and evaluation of the past research work based on the information in the database. This is envisaged to include the statistical analyses of the commodities and research topics covered, the institutions associated with the research, the type of document and the geographical distribution of the research. An assessment of the quality of the research and a description of the major achievements will be made. Gaps and weaknesses in the research will be pointed out.

In addition to KARD, we have a number of smaller databases in development. Not all databases are bibliographic in nature; one such in KARI is the Livestock Systems Database that will provide valuable data on a variety of inputs and outputs for a number of livestock systems. Other databases are still in formation, such as the gender database, which has evolved out of the need for our gender task force to have access to the growing body of literature relating to gender issues in rural development in Eastern and Central Africa. The particular value of this database as a research tool will be that every entry is linked to the physical existence and location of the hard copy, giving the searcher the assurance of access to the full document.

Compact Disc-Read Only Memory (CD-ROM) is proving to be a useful way for national agricultural research systems to gain access to large scientific databases (ISNAR, 1993). KARD has CD-ROM readers where international databases like the CAB abstracts can be accessed and information obtained. KARD has also provided eight selected KARI centers with same technology. This way, scientists will be informed not only on Kenyan research work, but also on the international developments. The ASARECA project will attempt to accomplish the above in all the participating countries.

INFORM is being developed in some of the ASARECA countries to provide a Management Information System (MIS) database, which should be able to provide data on ongoing research activities, budget costs, likely outputs and completion dates.

Information Exchange Through Less Formal Networks

Many studies over the years have examined ways in which scientists acquire their information. The formal pathways of access to bibliographies, databases, and published research papers play a large part in the information gathering process. However, it is interesting to note that most studies have identified the informal sector as being fruitful for the exchange of information and data. These informal and personal networks ma) simply be **conversations** between colleagues in the same department or exchanges of views at workshops such as this.

Researchers here may spend much of their time working in isolation, and do not have the same opportunities to benefit from these kinds of exchanges as those working in the developed world. The latest technology is changing all this. Not only does the **Internet offer** information in the formal sector by access to databases and web pages, but it also provides us with a unique opportunity to develop **informal networks** using e-mail. We have linked a few of our centers in the ASARECA countries to email, using the African Regional Centre for Computing (ARCC) as our Information Service Provider (ISP), and we expect to have connections to all others through the Africa Link Project (In some cases, these connections are being made in conjunction with ICRAF under the AfricaLink Project). We shall try to establish an e-mail network using our ISP, which permits messages to be circulated instantaneously to all network participants, and we also have an experimental web page on the ARCC server. Thus in the future, no scientist with a computer and access to a telephone need be isolated. He is an e-mail away from communicating with all his colleagues. Perhaps ASARECA could establish its own e-mail network address or web page?

Some Future Developments in ASARECA's Use of Information and Technologies

- Leased line connections to Internet via the ISP. This will give NARI's immediate and unlimited access to the Internet without the problems of making a dial-up each time.
- Dial-in facility at NAIFP AND RAIFP to enable centers to dial to the Internet via our leased line. This should make Internet access easier for remote sites.
- Development of a LAN for sharing files, accessing databases, and the Internet from any office in the NARI's buildings.(A WAN could well be an extension of this later provided that sustainability can be assured.)
- Database (CDS-ISIS software) creation in all NARI's to be accessible by dial-in e-mail connection for remote interrogation.
- Multiple CD-ROM databases on a juke box accessible in the libraries and through the LAN.
- Electronic transmission of documents to remote sites using scanner.
- GIS has slowly developed as a major tool for natural resource personnel. GIS allows large amounts of data to be compared and results displayed graphically. Comparing socio-economic survey data with natural resource data can help researchers formulate action plans based on the needs of the people. The development of technologies to standardize such comparison should be emphasized in future.

Conclusion

Information has a critical role to play in Eastern Africa's development, and the need to enhance the agreed information framework is real. This information structure should be sensitive to the needs of the participating institutions and research scientists. A career structure for information personnel needs to be agreed upon, if the institution is to retain trained staff. A strong Regional Agricultural Information Network (RAIN) will enhance effective coordination and utilization of existing information resources in the region and allow the dissemination of IPM technologies.

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Impact of Electronic Networking
A case for Uganda under Africa Link Project

Esther Lwanga Semakula
Coordinator, Agricultural Research Information Service (ARIS), Uganda

Introduction

What is ARIS?

Agricultural Research Information Service. One of the support service Units of the National Research Organization (NARO), in Uganda.

Role of ARIS

To facilitate agricultural scientists find the information they need to carry out their research activities more effectively and subsequently to solve farmers' problems.

AFRICALINK Project in Uganda, 1996

1. Electronic Communication

Access to Electronic Communication by agricultural scientist and information professionals has been made possible by the support of USAID, through the Africalink project since mid 1996. There are over 25 e-mail accounts and one for Internet at ARIS.

2. Internet Workstation

The project has provided an Internet Workstation at ARIS:

- Pentium Computer
- CD ROM Drive
- Printer
- Windows' 95

3. RAIO Link Facilities

To cater for scientists in areas where there is no telecommunication infrastructure, the project has made arrangements to provide Radio Link facilities. Namulonge Agricultural & Animal Production Research Institute (NAARI) has been selected to benefit from the PILOT Project of RADIO LINK, due to start any time from now.

Constraints Before E-Mail

- Information flow was not very smooth.
- Communication was relatively more expensive, relaying on faxing and telephoning.

Impact of E-Mail Connectivity

1. To Agricultural Scientists.

What can scientists do that they could not do before e-mail?

- Easy, reliable, and fast communication
- Exchange ideas more easily with their counterparts
- Are able to prepare joint papers or review papers easily and on time using the facility of attaching files.
- Able to communicate to a big group simultaneously within a very short time.
- Learn easily about workshop/meeting announcements and are able to attend.

2. To Informational Professionals

- Information services have improved tremendously. Request for Document Delivery offered by CTA are done by e-mail.
- Book Ordering is by e-mail.

Impact of the Internet

- Scientists are able to access a vast range of information resources, particularly web sites.
- Information personnel have been able to bookmark/download several relevant web sites to save on telephone costs and fast access.
- ARIS has been able to create NARO web site, now hosted by ISNAR:

    http://www.cgiar.org/isnar/hosted/naro.htm

Future Plans

- Web Access via e-mail
- Discussion Groups
- Local ISP to host NARO we site as well.
- Setting up a Local Area Network on a Server

Conclusion

The AFRICA LINK project has created awareness among many agricultural scientists and Information Professionals of the benefits of electronic communication. It has made a big change in the way they communicate.

The information gap between the "haves" and "have nots" may be reduced to a great extent in the near future.

Acknowledgement

ARIS on behalf of NARO wishes to register sincere appreciation to USAID for the electronic connectivity through the AFRICALINK Project. I wish to say thank you to the sponsors and organizers of the IPM Communication Workshop for having given the opportunity to attend and share experiences.

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Networking for Development: Agricultural Research Networking in Eastern and Central Africa

Michael Hailu
AfricaLink/ICRAF Coordinator
Jeffrey A. Cochrane, USAID/AfricaLink Advisor

In recent years, the advance in information technology, particularly the Internet, has offered tremendous opportunities for information access and exchange. It is also changing the traditional way of working for many individuals and institutions.

However, researchers and development workers in Africa have not benefited as much as they should from the fruits of modern information and communication technologies (ICTs). As a result, African scientists are becoming increasingly disadvantaged in their capacity to interact with their peers and access up-to-date information.

To try and redress some of this imbalance, several donor agencies are supporting connectivity projects that would enable better email and Internet access by African researchers, educators, and development workers. The joint ICRAF/USAID AfricaLink program aims to facilitate and improve email and Internet connectivity to members of national agricultural research systems (NARS) that participate in regional research networks in agriculture and natural resources management.

Activities are organized around individual research networks. These networks are defined with respect to specific activities. They might be defined as a formal steering committee for a pan African network, or as small working groups of scientists studying a specific research question. IPM-Africa might be construed as a network, with many members working on problems at the pan-African level. IPM-Rice might also be organized as a "network" just for scientists working on rice problems.

Since its inception in 1996, for all of East Africa's networks affiliated with ASARECA, AfricaLink has undertaken the following activities:

- Developed an action plan for AfricaLink implementation; discussed and approved it with ASARECA members.
- Provided basic connectivity for network members in most of the ASARECA member countries.
- Initiated a technical support mechanism through a regional help desk.
- Initiated a user training programme at national levels.

The following activities are anticipated over the 5-year period for each network assisted under AfricaLink:

Year 1

- A critical mass of the network's members secures basic Internet connectivity (e.g. email).
- A critical mass of the network's members acquired basic mechanical skills (e.g. how to send and receive a word processing document via email).

- Basic and appropriate technical support is identified to serve the network's members, and procedures for the network's members to access this support are established.

Year 2

- In collaboration with key regional and international information resources (e.g. the CGIAR libraries, key program specialists around the world), network leaders enter into a process to make critical information resources available to their members.
- Basic and appropriate training and other resources are provided to network leaders to prepare them for the task of facilitating flows of critical information.
- Each network uses the connectivity provided to share information among its members, e.g. through the setting up of discussion lists and listervers, electronic delivery of network newsletters, etc.
- A draft information management strategy is established by each network to take advantage of access to new information technologies. This initial strategy focuses on collaboration among the network's membership and on securing access to major electronic information resources in the region and worldwide.
- The network's members are informed of the network's information management strategy, feedback is solicited, the strategy is approved, and the necessary resources and training for the implementation of the strategy are identified.
- Initial steps to implement the network's approved information management strategy are undertaken.

Year 3

- The network's membership takes advantage of information communications technologies to collaborate on joint programs, with increased specialization and routine sharing of program status. Training and expert facilitation is provided.
- Whereas initially the network's information management strategy focused on collaboration within the network and acquisition from key regional and global information resources, the strategy now moves to the presentation of the network's major findings to a global audience, e.g by making information available on the Web.
- Technologies are adapted to serve the network's publishing and reporting requirements under the revised strategy. For example, a site on the World Wide Web may be established, or a facility may be provided permitting scientists in several countries to record their key data on a central computer via the Web. Technical consultations are provided to enable the network's members to decide on the appropriate course of action for their network.

Years 4 and 5

- Emerging technologies are evaluated and analyzed for appropriateness to the work of the network.
- Strategies are developed to incorporate appropriate new technologies.
- Appropriate training is provided to the network's membership in the application of new technologies

For East Africa's ASARECA networks, specific results to be accomplished by AfricaLink over the next five years are presented with the table that follows.

The networks listed in this table are indicative. The actual networks to be assisted in a given year are determined by ICRAF in consultation with ASARECA and USAID. Among the selection criteria in determining assistance is the interest expressed by the individual network's leadership in participating in the AfricaLink program. The numbers in the table reference specific results to be accomplished each year, and correspond to the numbered results listed above.

NETWORK	**1998**	**1999**	**2000**	**2001**	**2002**
ASARECA COD	4,5,6	7,8,9	10,11,12	13,14,15	13,14,15
PRAPACE	4,5,6	7,8,9	10,11,12	13,14,15	13,14
AFRENA	4,5,6	7,8,9	10,11,12	13,14,15	13,14,15
ECABREN	4,5,6	7,8,9	10,11,12	13,14,15	13,14,15
AHI	4,5,6	7,8,9	10,11,12	13,14,15	13,14,15
BARNESA	4,5,6	7,8,9	10,11,12	13,14,15	13,14,15
EARRNET	4,5,6	7,8,9	10,11,12	13,14,15	13,14,15
ANAFE	4,5,6	7,8,9	10,11,12	13,14,15	13,14,15
ECSARRN	1,2,3	4,5,6,7,8,9	10,11,12	13,14,15	13,14,15

ECARSAM	1,2,3	4,5,6, 7,8,9	10,11,12	13,14,15	13,14,15
ECAMAW	1,2,3	4,5,6, 7,8,9	10,11,12	13,14,15	13,14,15
ECAPAPA	1,2,3	4,5,6, 7,8,9	10,11,12	13,14,15	13,14,15
POSTHARVNET	1,2,3	4,5,6	7,8,9,	10,11,12	13,14,15
EAPGREN	1,2,3	4,5,6	7,8,9,	10,11,12	13,14,15
AARNET	1,2,3	4,5,6, 7,8,9	10,11,12	13,14,15	13,14,15

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Case Study for the Integrated Pest Management Information Communications Workshop

Jeffrey A. Cochrane
USAID/AfricaLink Advisor

In Uganda there is a USAID supported project called "Investment in Developing Export Agriculture" (IDEA). The goal of IDEA is to improve rural men's and women's income by assisting agribusiness firms and associations to expand production and marketing of selected agricultural crops and products for export. To accomplish this goal, the project established the Agribusiness Development Centre. The ADC employs technical expertise to help its clients realize export opportunities and mitigate risks. In essence, the ADC is a resource center, where agribusiness firms and associations can receive assistance. Among its services, the ADC offers commodity studies and information on current market conditions around the world.

To provide these information services, the ADC has established a small library of relevant material, mostly subscriptions to trade periodicals, newsletters, newspapers, and other key sources of information on current (spot) market conditions, new product developments, and extract details pertinent to producers and traders in Uganda's growing non-traditional agriculture sector. The staff of the ADC then produce fact sheets or commercialization bulletins of their own, tailored to the needs of the Uganda agriculture export and investment market. These are distributed to subscribers in Uganda by courier, postal service, or fax, as well as by electronic mail in those few instances where clients have access.

Recently, the Uganda telecommunications scene has been transformed by the introduction of relatively low-cost access to the World Wide Web. Staff indicate they expect to use the Web as an additional source from which to filter and synthesize information for their subscribers.

Discussion Points

- There is much talk about the "last mile" problem on the Internet. This has to do with helping the world's poorest acquire access. It is all well and good, some say, to pass Internet signals across fiber optic cables and then satellites to ground stations in African capitals, but if the nation's poor do not even have a telephone at home, let alone a computer, then are we not simply creating an information elite?
- The IDEA project demonstrates one solution to the "last mile" problem. It suggests that it is not necessary for everyone to have direct access to the Internet in order to have access to the information that the Internet contains. The true cost of direct access to the Internet must include the cost of access to a telephone, a computer, and the Internet account with a local service provider, a significant investment for many African farmers and traders. Is the value of the information contained on the Internet sufficient to justify such an investment?
- Having indirect access to the Internet typically implies utilizing the services of an information "broker." Who pays the broker, and how does that affect the information ultimately transmitted the "last mile?"
- An alternative to the information broker is the information "kiosk" or "telecenter." These are computer laboratories that provide access to computer equipment connected to the Internet, typically charging a fee per hour. Users have direct access, but at a price. Still, for a trader or farmer who will not require access more that a few hours a month, a kiosk is an attractive processed by an information broker. The IDEA project is considering allowing visitors to their offices access to a terminal, an adaptation of the kiosk idea. Is direct access necessarily better than the filtered access provided by an information "broker?"
- This general idea of telecenters is attracting great interest among donors. Is this where donor funds should be invested?

Responses by Idea Staff to Discussion Points

- The nation poor are mostly illiterates. The only effective means of communication is by radio in their language. In fact, our market news reports are transmitted over radio, plus some of our other extension messages on crop husbandry. We know that the agricultural hour has wide listenership, and it is simple enough for the peasants. One could never put computers near these people directly, so we use this alternate and accessible means of transmitting "what the computer says."
- For the most part, the majority of users/clients could never justify the internet hook up. As a project we focus on the "poorest of the poor" and are frowned upon by many in USAID circles if we even look in the direction of "established entrepreneurs." Most of our clients, including the client base of exporters often have a fax, but not internet or e-mail. They are often individuals, and they don't have the time to browse, they are not computer literate, they are too small an operation to hire an individual to provide this information, and very importantly, most don't have the necessary interpretive skills to analyze raw market data. Therefore, we are the conduit — accessing, processing, and disseminating this information that would otherwise be out of the reach of these relative new entrants to global markets.
- As a broker, our information is free of charge. Even in the developed world, including USA, most market information is provided as a public good, at least in its raw state. The amount we could collect in some form of fee for service would probably be less than the cost of collection, or users would "shop" to find other free sources or drop the service.
- The computer library or kiosk would not work. We would never allow outsiders near our computers and internet. Given electric power problems in Uganda, sensitive modems, sensitive software and inexperienced operators, the system would be ruined within a matter of days. We probably spend well over $100 per month per computer on repairs, and most of this is operator screwups. We can show the world a cupboard full of destroyed motherboards, modems, sound cards, every thing imaginable. Some of the worst experiences are the TDYers who are at least knowledgeable about computers. So there is no way we would open our shop to outsiders. What we do have though is a full time Market Information Manager and access through the Internet to other data. We also make some hard copies. So, if a client wants something more than what is in our regular reports, the client can come into the ADC and sit with the market Information Manager who will gladly source whatever data the client wants. In practically all cases the information needs are modest and we have been able to deliver. You can't imagine how much frustration we have with computers/modems/phones/electricity/service providers/operators/etc.

Most other data providers have similar experiences. The majority of Government/ parastatal entities can't afford to pay for repairs, or pay for the subscriptions to data banks, or they are frequently cut off because the telephone bill or the internet bill has not been paid, or any combination of the above.

We don't discount the fact that Africa needs to be global in this information age. But we don't want to try driving a Rolls Royce through the jungle. So, our best solution is to be the service provider (where we can pull out the check book and hope to have whatever problem there is rectified and be back on line within a week) and then use more appropriate technology, such as fax and radio for spreading the message.

Several of our clients have also expressed the act that market information that we provide is of great historical interest and to some extent it helps in their decision making, but it is historical. These clients would like "deal making" information, i.e., linking buyers and sellers so they can transact business using the internet, or at least information they were able to view on the internet. We are planning to set up and ADC web page in march 1998 using the "Uganda Site" at the Uganda Export Promotion Board. There we will include our market reports, but we also plan to list inquiries on commodities (both buyer and seller). It won't cost a fortune to try it.

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Group Discussion: "Provocative" Themes/Questions on Networking.

Jeff Cochrane
USAID AfricaLink

Session 3B

Purpose: To stimulate thought about and discussion of major telematics information management issues that will likely pertain to IPM networking.

Propose two questions to be handed out by resource people.

Three discussion groups:

- Information Sharers-people who have information to share
- Information hungry-don't have access to information they need.
- Information facilitators-help the other two groups.

Session 3C: Report Out

Question 1—E-mail has the informality of a personal conversation as well as the formality of the written word. Some organizational directors want oversight of written documents as produced by staff. Is this a problem in your organizations?

> **Group 1—**Yes, there is a problem, but the problem is not prevalent in Universities. Some cases E-mails required approval. **Solutions—**Convince institutions the value of E-mail culture. Donors need to be part of the solution. Who do they give the computers to? Just to the researchers or to administrators as well. Give Internet access to the "boss" as well. Make sure that "all" correspondence goes to the administrator.
>
> **Group 2—**About 10 per cent said they had a problem. Approval needed to send out E-mail. **Solution—**Convince the boss of the value of E-mail. Should always have the courtesy of copying the boss.
>
> **Group 3—**Universities and NGOs have some problems because they have more structure. **Solution—**Make sure that senior people have access. Develop policy.

Question 2—Are the differences in access to the Internet, i.e. the headquarters staff and the field staff or extension agents, creating an electronic elite?

> **Group 1—**Yes, there is an elite, but benign enthusiasts. Need to create champions of the methodology. May be a matter of time. Important issue is an awareness of what the Internet is all about within these institutions. It is not about formal communication and control; it is about free communication and informality.

Group 2—Priority given to headquarters. Priority not due to identified elite, however. Priority given because of problems of facilities. Decisions often because of budget problems or physical infrastructure, i.e. lack of telephone lines etc. and training. Solutions include the use of radio links with appropriate software. Want to know what resources are available from AfricaLink.

Group 3—Elitism is not created. Solutions include Internet should be a budgeted item. Requires capacity building. Before information is useful, important to pay attention to feed-back methods. Generally a problem of distribution of resources. Must change policy. Should think beforehand to make information useful. Don't depend on the technology.

Comments

The workshop needs to look at the Internet in the context of overall information needs and that the information exchange is a two-way process among: donors and project staff, headquarters and field staff, research and extension, and between extension and the farmer.

Even though the participants were split into different groups, they all dealt with the questions in a similar way. This may indicate that all participants responded to the qualities of facilitators, sharers, and those hungry for information. It also indicates that IPM communication is indeed a two-way process. All the shareholders are in a position to give as well as seek information.

E-mail/Internet should not be equated to written communication/documentation but rather with telephone/oral communication. It is about free communication.

In creating an E-mail Internet Network, we should strive to lay down rules and regulations for all users.

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Desired Outputs of the Workshop and How to Achieve Them

Sina Luchen
Zambia

(Transcribed by G.A. Schaefers)

Session 4

Purpose: To discuss a process to ensure that the desired workshop outputs are identified and prioritized and add to existing workshop objectives, outputs.

Group 1—NGO Extension, Intermediaries

Good linkage between IPM practitioners regionally/globally

- Recognition of new IPM information networks

To accomplish the above, we must do the following:

- appreciate our understanding of the farmers existing indigenous knowledge
- strengthening of knowledge on IPM
- decentralizing information on IPM
- characterize the type of IPM information to suit our specific localities.

Group 2—Research, University, Academia

- Existing IPM related initiatives identified and interactions strengthened and new initiatives and plan and actions identified
- Resolution to produce directory of information and IPM specialists (farmers) in Africa as well as information about pests and their natural enemies, available electronically.

Group 3—Government Bodies, Technical Assistance Agencies, Donors

The objectives and outputs as stated are acceptable in terms of direction, however, they assume too much of an hierarchical structure. Instead, all three identified groups, i.e. recipients, transfer intermediaries, and source institutions play several roles at the same time. Farmers create and spread knowledge and influence issues. They receive methods and procedures. Suppliers should be influenced by all these perspectives. Electronic information flow from the outside to the insiders (farmers) faces a barrier beyond which electronic media are inappropriate. However, knowledge and concerns about policy issues should flow from farmers to wider audience and can be significantly enhanced by electronic media.

Group 4—Information Services/Providers

Implementation plan for the recommendations of this workshop

- Strong effort to fill the missing links (!) in our current network (not limited to IPM!)
- Creation of a steering committee for the follow-up

- Focus on local institutional strategy for IPM info sharing
- Facilitate a global strategy for IPM information network

Comments

Sina Luchen

I see commonalty in the "expected outputs" from the various groups and the objective and program for the workshop. However, two main issues are to be noted:

- suggest, rightly, that the workshop is structured in a too hierarchy form of info suppliers and info users, and it should not be that way.
- also info will flow two days (or more) and it should capture farmers' knowledge, as suggested by the NGO/Extension?

Tsedeke Abate

I want to point out that there is an assumption that there is already a package of information that is ready to be transferred for use electronically. While it is true that research results and farmers knowledge are available, we should not treat the question of developing and refining appropriate IPM info and technology lightly.

Tony Putter

Farmers are the overwhelming specialists doing IPM. When they try to take action in their realities, they confer meaning on information. They create knowledge no matter where these facts come from. Therefore, this process is at the heart of all IPM including the kind of research that is done.

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Integrated Pest Management (IPM) Practitioners and Their Information Need in Cameroon

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IPM practitioners in Cameroon have over time, used indigenous knowledge systems in the control of pests. Pest management fell within the following groups viz: cultural, host-plant resistance, chemical, and their efficiency nor documented. This knowledge has, been localized and not disseminated to other needy users.

IPM practitioners have lacked in information dissemination, training, and coordination. Dwindling developmental procedures have further hampered the use of electronic media in getting access to developed IPM technologies from institutions of developed countries. Training of farmers, extensionists, and researchers on IPM programs will enhance and sustain production with a stable environment. Organization of workshops involving all stake-holders and coordination IPM programmes will go a long way in reducing pest problems.

Introduction

Pest control has mostly concentrated on the use of pesticides. The undesirable results of their use has been:

- Development of resistance to chemical pesticides by target pest species.
- Outbreaks of non-target secondary pests, which then become major pests.
- Extermination of beneficial organisms in the environment, thereby aggravating the pest situation.
- Environmental pollution.
- Accidental poisoning of farmers and poorly-trained pesticides applicators.
- Integrated Pest Management (IPM) evolved to correct this unwholesome state of affairs. Pests are not usually the principal limiting factors in crop production but IPM is an integral part of production and has to be studied in the total context of the system.

IPM has been variously defined. Stern et al. (1959) first introduced the integrated control concept as a method of reducing pesticide inputs. IPM utilizes all suitable techniques and methods in as compatible a manner as possible and maintains pest population at levels below those causing economic injury. Metcalf and Luckmann (1975) rightly stated that IPM is the intelligent use of pest control actions that will ensure favorable economic, ecological, and social consequences. Adkisson (1986) defined IPM as an insect control system using two or more tactics for suppression of pest numbers.

The basic philosophy of IPM remains the minimizing and prevention of losses caused by pests. However, the tools used for this purpose are now more in number and some quite complex in their operations. In fact, as noted by Parrella and Keil (1984), IPM is a cooperative science where talents and long-terms answers to the particular pest problems faced by man, his crops, and animals are sought. In practice, IPM programs would have to be developed locally for each pest.

In establishing an IPM program, the following points have to be considered:

- Identity of the pest
- Basic biological/ecological studies

- Crop loss assessment
- Cultural practices in the control
- Biological control methods
- Quarantine
- Host plant resistance &
- Pesticides use.

Sound IPM programs can only be based on high-scientific study of the pest, its hosts, and the ecosystem concerned. Development of the scientific background involves ecological data analysis, interpretation, and continued monitoring and identification of key factors that need to be manipulated to minimize pest damage. IPM programs are bound to differ with different pests.

IPM practitioners in Cameroon have, for a long time, used indigenous knowledge systems (IKS) in the control of their pests. Although international knowledge systems, on pest management is being promoted through formal school systems, research institutions and industrial organizations, the IKS have neither been well documented nor studied in depth for recommendation for use on a broader spectrum. These IKS vary with animal species, crop components, ecology, and the culture of the people.

Over the centuries, human beings have been generating knowledge to live in an increasingly more balanced relationship with their natural and social environment. Many communities in different ecological zones have accumulated a lot of location-specific knowledge and practices on natural and animal health, soil, and water conservation, education, etc. These systems are not well documented for use. There is lack of information of their effectiveness and where they can be applicable. Even where the people know of the methods, they cannot use them for lack of training. In effect, IPM programs in Cameroon are not coordinated for effective implementation. It is for these reasons that this paper addresses the problems of IPM practitioners in Cameroon, which range from lack of information on existing practices, their effectiveness, where they can be applicable, training facilities, and coordination.

Materials and Methods

A nation-wide extensive diagnostic survey of cassava production constraints in Cameroon was carried out at the just end of wet and dry seasons of 1994, sponsored by the Ecologically Sustainable Cassava Plant Protection (ESCaPP) project. Sampling sites were pre-selected in the cassava producing ecozones and validated on the field to meet with the criteria of accessibility, presence of cassava farms three to six months of age, and farmers prepared for focus group interviews. Sixty-one sites were randomly chosen using the computer gridline method, and each represented a 75 X 75 km. area. A sampling protocol questionnaire was prepared, which covered the agronomic, plant protection ,and socio-economic aspects of crop production. The questionnaire was administered by a team of crop productionists, protectionists, and socio-economists. The data collected were analyzed.

The survey results revealed that farmers grew cassava in association with other staples and managed plant pests in various ways, (ESCaPP, 1994 & 1995). A workshop on indigenous knowledge systems on plant protection was convened. The proceedings of the workshop were edited and published (Awah and Bakia, 1995).

With these relevant pieces of information at hand, the ESCaPP project then tried to solve some of the cassava pest problem by implementing intervention technologies and training extension workers and farmers in cassava plant protection practices by organizing training programs, Farmers' Field Schools (FFS), and strategic field research operations.

Results

Farmers in Cameroon were not only managing pest of cassava but all the crops that they grew either in mono- or mixed cultures. Pest management practiced occurs before planting the crops (seed treatment), on the field when the crops are growing, or during post-harvest. Different pests received different management methods, and these methods also varied with the culture of the people.

Pest management practiced by farmers fell within the following groups:

- Cultural
- Host-plant resistance
- Chemical &
- Biological.

The ESCaPP project taught extension workers and research technicians on biological control in the in-field multiplication and releases of predators against insect pest. Farmers were also taught about selecting good planting materials, handling and storage, timing of planting, soil improvement, improved cropping systems ,and general field crop management.

Pest problems in Cameroon are classified into eight major groups, and two or more IPM methods are used in their control.

- *Rodents e.g. came rats or grasscutters, giant rats, porcupines, and squirrels. IPM practitioners in Cameroon use cultural, chemical, and host-plant resistance in their control.*
- *Mammals e.g. monkeys, goats, cattle, pigs, antelopes, human beings. Cultural, chemical, and host-plant resistance are used in their control.*
- *Birds e.g. partridges, hawks, domestic fowls. Cultural and chemical methods are used for their control.*

- *Arthropods I insects e.g. grasshoppers, locusts, cassava mealy bugs, weevils, termites. Cultural and chemical methods are used in their control.*
- *Arthropods II e.g. Mites. Cultural, host-plant resistance, and biological control methods are used.*
- *Molluscs e.g. snails. Use of cultural and chemical methods in their control.*
- *Weeds. Use of cultural and biological methods in their control.*
- *Diseases. Use of cultural and host-plant resistance in their control.*

In most cases, farmers used two or more control methods in the management of their pests.

Under cultural practices the following operations were used:

- fencing, trapping, hunting, scaring, good storage structure, proper and timely farm sanitation, good seedbed preparation, bush burning, soil improvement, fallows, rotations, molding, mulching, hand picking, use of clean planting materials, sieving and winnowing, intercropping, roguing, careful harvesting and handling of crops and timing of harvesting, and timing of planting. All these practices either reduce the pest problem directly or indirectly.

Under host-plant resistance the following practices were used:

- Choice of crop varieties, selection of planting materials with low pest score symptoms, planting of resistance/tolerant varieties,

Under chemical, the following were used:

- Use of plant extracts; poisoning usually mixed with baits; use of wood ashes, kerosene, and limestone mixtures; use of pesticides mostly on cash crops like cocoa and coffee; and smoking, especially before storage.

Under biological, the following were used:

- Release of insect predators to control cassava green mites, use of cats to reduce rodent population, and use of suppressive plants. Some farmers use live plants to intercrop with their staples to suppress weeds.

Discussion and Conclusions

IPM in Cameroon incorporated two or more control practices in the management of crop pests. The number and type of practices used are influenced by the growth stage of the crop, the ecology, and the season. The use of cultural practices in pest control could be direct where the pest is physically removed from the farm or indirect, aimed at creating unfavorable conditions for the pest to thrive. The direct methods included hand picking, weeding, roguing, trapping, hunting, and fencing. Indirect methods involve many agronomic practices like intercropping, rotations, timing of planting and harvesting, and good seedbed preparation. All these practices have been handed down to others from generation to generation without proper documentation. Their effectiveness has hardly been evaluated to determine which are the most appropriate to use in different crop situations. This leaves a gap in the proper understanding on how these practices work.

Farmers in Cameroon have different control methods for each pest. This implies that IPM programs have to be pest specific. During the crop's life cycle in the field, different pests attack and their evolution and population dynamics are influenced by the seasonality changes. It means that for one crop to finish its life cycle in the field or under storage, different IPM programs need to be practiced. Farmers and extension workers in Cameroon select their planting materials from diseased free plants. Here, host-plant resistance is used. During the life cycle of the crop, rodents are a problem. Fences may be built to protect the crop, or chemical baits may be used where there are no cattle.

In most case, these indigenous technologies are localized and not documented. Access to them becomes difficult for other need users. There is a need to study the effectiveness of such methods, document them, and disseminate them to potential users through training. The extension systems should also be well strengthened to sustain the developed and disseminated technologies.

IPM has been a long-time practice in Cameroon. Each group or groups of IPM practitioners have been doing it their own way without proper coordination. There is need to hold regular workshops to share information and update IPM programs. This will need funds and proper coordination. Proceedings of such workshops will go a long way to yield a stable environment. Establishment of communication linkages will allow researchers and scientists to have access to IPM programs of other institutions, which will existing systems. Where IPM programmes are well defined, they can be used as intervention technologies in similar ecologies and not merely as strategic research, which is time consuming and involves more funding.

Whatever the case, in developing good IPM communication, the status of the participating countries should be taken into consideration. Some countries are more developed than others and are capable of acquiring sophisticated electronic communication systems. This approach may not meet the demand of less developed countries practicing IPM. Still, policy makers should be enlightened on the need for electronic media to facilitate serious effect on the environment. Training workshops for researchers and others involving policy makers should be organized periodically to update people on latest developments on IPM.

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The Ethiopian IPM Program: Towards Developing a National Agenda

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Background

The most important feature of all Ethiopian agricultural systems is their complexity and richness in biodiversity, as a result of which occurrence of pest outbreaks on the magnitude known in monocrop commercial agriculture is rare (Abate 1997a). As in many countries in Africa (Abate & Ampofo 1996), control of crop pests in Ethiopia is achieved through the use of a traditional IPM approach that consists of appropriate cultural practices, varietal resistance, and use of locally available materials. Use of pesticides by small scale farmers is almost non-existent.

Agricultural intensification and extensification, resulting from increased population pressure and government's efforts to achieve self-sufficiency and food security, entails use of high yielding varieties or hybrids that require high external inputs, including pesticides. This leads to reduced vegetational and natural enemy diversity. Experiences of post green revolution in Southeast Asian countries show that chemical pest control is unsustainable and pesticides are not a necessity for increasing agricultural productivity (Raheja 1995).

Pest Management Options

The most appropriate option for pest management for sustainable agricultural development in Ethiopia is therefore an integrated pest management (IPM) approach based on cultural control, natural biological control, and use of locally available materials and host plant resistance methods (Abate 1997b). It is thus appropriate that IPM should be adopted as national crop protection policy if the goal of sustainable agriculture is to be achieved in Ethiopia.

The first step to be taken in research and implementation of IPM in this country is initiatives to overcome constraints to IPM. Globally speaking, constraints to IPM may be technical, institutional, legislative, educational, economic, or social (Zethner 1995).

In Ethiopia, the major stumbling block to IPM is the lack of awareness. This is perhaps the major cause for not appreciating the role of IPM in Ethiopian agriculture. At present there is a general lack of education in IPM practices at all levels of learning, be it for researchers, extensionists, or farmers. Universities, colleges, and schools in Ethiopia do not have full fledged IPM courses in their curricula.

Another major constraint to IPM in Ethiopia is the lack of coordination and collaboration within and among institutions. To date, there are initiatives by a large number of national, regional, international, and nongovernmental organizations (NGOs) that are aimed at developing and/or implementing IPM. However, there is little coordination and collaboration among agencies involved in IPM activities.

Recent Developments Towards IPM in Ethiopia

Considering the fact that IPM is an integral part of sustainable agricultural development, there are positive signs that the Ethiopian government will give a high priority to IPM in its national agricultural research and development policy, although the adoption of IPM as a national policy is yet to be established. Furthermore, also recognizing the importance of IPM for sustainable agricultural development in Ethiopia, the Crop Protection Society of Ethiopia (CPSE) has established an *ad hoc* National Steering Committee on IPM during its fourth annual conference in May 1996. The Institute of Agricultural Research (IAR) has also signed a memorandum of understanding in late 1996 with the IPM Collaborative Research Program (IPM CRSP) at the Virginia Tech, USA, and assigned a national coordinator to lead this program.

The CPSE *ad hoc* committee, consisting of senior crop protection staff from the Ministry of Agriculture, IAR, and Alemaya University of Agriculture (Debre-Zeit Research Centre) was charged with the responsibility to establish a national IPM steering committee.

Draft Recommendations of the Committee

The CPSE *ad hoc* committee recommended that a National IPM Steering Committee (NISC) be formed as a matter of urgency and has proposed the following terms of reference for NISC. _

Proposed terms of reference for NISC

Under the overall guidance of the Crop Protection Society of Ethiopia (CPSE), NISC will promote adoption of IPM in Ethiopia. More specifically, the Committee will:

- Foster research and development of IPM in Ethiopia;
- Provide the intellectual leadership for the development and implementation of IPM in Ethiopia;
- Assist the development of a national IPM strategy;
- Enhance public awareness about the importance of IPM in Ethiopian agriculture (through publications, media, seminars, and training);
- Encourage and provide technical support for the development of teaching materials on IPM;
- Encourage and provide technical support for organization and implementation of appropriate training in IPM;
- Encourage the preparation of and review viable research and/or implementation of proposals on IPM;
- Promote the implementation of IPM technologies and strategies;
- Provide a forum for exchange of ideas, experiences and information on IPM; and
- Seek ways and means of strengthening IPM coordination and collaboration with national, regional and international organizations within and outside the country.

Proposed membership of NISC

The proposed NISC will consist of representations from all stakeholders (research, extension, education, and policy makers) in both governmental and nongovernmental organizations. Disciplines will include entomologists, plant pathologists, weed scientists, agronomists, breeders, socio-economists, extensionists, and experts of biodiversity and natural resources management.

The NISC will be run by a national secretariat that will oversee promotion of IPM in the country. It will have three elected officers: the National Coordinator, a secretary, and a treasurer. The secretariat will elect a coordinator from among the NISC members. The NISC shall form subcommittee(s), as needed.

It is suggested that the Ethiopian Agricultural Organization (EARO) provide an office for NISC.

The NISC should endeavor to foster the development and implementation of IPM in Ethiopia by forming a national IPM Network (IPMNet-Ethiopia). It will form the framework for and give the leadership to promotion of IPM both in smallholder and commercial agriculture in the country.

Strategy for Implementing the IPM Agenda in Ethiopia

The Ethiopian IPM research and implementation agenda consists of five major thrusts, as elaborated by Abate (1996). These are:

- On-farm testing of available technologies,
- Characterization and quantification of pests and their natural enemies (to establish baseline information),
- Developing an inventory of indigenous knowledge on pest management strategies by farmers,
- Generation of appropriate technologies, and
  Training.

There has been significant progress in the generation of IPM technologies from research in Ethiopia. These can be implemented in farmers' fields. Initially though, it is necessary to prioritize crops and pests that should get particular focus; thus a limited set of crops and areas will be chosen to serve as pilot projects so that experience can be gained and the technologies can be verified and demonstrated, using the "Participatory-Farmers-First" approach to all stakeholders (farmers, researchers, extensionists, policy makers).

Information Needs

What I am going to present in the following few lines is not only the information needs, but also what I expect from this workshop. These I present as follows:

- It is my hope that each one of you in this workshop would contribute ideas that will help improve our draft proposal on the formation of the national IPM.
- I would appreciate listening to lessons learned from experiences of countries and individuals who have gone through this process of forming a national IPM policy and implemented IPM.
- As you very well know, it is extremely difficult for us in Africa to subscribe to journals on a sustainable manner.

Our program can therefore benefit a lot if there are ways and means of having access to published or printed material for reference.

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Proceedings of the Integrated Pest Management Communications Workshop: Eastern/Southern Africa

March 1-6, 1998, Nairobi, Kenya

International Centre for Insect Physiology and Ecology (ICIPE)

Biovillage—Initiative

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Background

Tsetse and Trypanosomosis Control and Impact Assessment

Glossma pallidipes suppression has been going on since April 1995 in Damot Woyede Woreda and January, 1997 in Gurage Zone with the active participation of the Community and the Southern Regional Government in Ethiopia. The regional government and the communities contributed over 3,000 NG2G traps, and the fly population has been reduced by 96 percent. The disease has declined significantly.

The socio-economic survey showed that average milk per cow/week before suppression was 4.10+ 0.260 litres. After suppression of tsetse flies showed a significant improvement of production to 8.71+ 0.526 litres during the survey time. As a result of the suppression efforts, milk production increased more than 100 percent. The over-all mean percentage charge of livestock mortality before and after suppression was reduced significantly.

Comparison of mean age to reach fertility for all animals under the study was conducted. As a result, the mean age required to reach fertility after tsetse fly suppression was reduced by 23 percent. Furthermore, the survey showed that the fly control operation decreased abortion and increased calving rate.

In the survey areas, the vast majority of the households willingly responded regarding the presence of tsetse flies and were aware of the problems associated with them. Sixty-five percent of the households in Damot Woyde, 23 percent in Cheha, and 12 percent in Enemore knew that there was a relationship in their respective villages between their problems and the tsetse flies. This awareness was one of the fundamental basis for the success of the study and the field trials.

In Damot Woyde Wreda *Glossina pallidipes* and biting flies (*Tabanid* spp, *Stomoxys* spp. etc.) were collected monthly from the NG2G traps from 1995 to 1997. The total fly catch was *136 G. pallidipes* and 24, 113 biting flies. In Gurage Zone (Cheha, Enemor and Goro) over 2,500 *G. pallidipes* 20,000 biting flies were collected. A study done in collaboration with the Sodo Regional Laboratory in Sodo during this period demonstrated that the *G. pallidipes* population dropped from 100 flies/trap/day observed at the beginning of the study to ultimately zero. In order to reduce trap cost, three variations of the basic trap were tested in Sodo Bedessa, Arba Minch, and Gurage Zone. One version, Debella/blue/sisal, is able to increase the catch of *G. pallidipes* females by an index (factor) of 2.46 and males by 3.285, while being about five times less expensive than the cost of the standard version.

Zebu cattle with trypanosome infections had very low packed cell volumes (PCV) compared to uninfected animals with PCV>25. The low PCV is associated with trypanosome infection. The most prevalent parasites found were *Trypanosoma congolense* (69.92%) and *T.vivax* (27%). Mixed infections by these parasites accounted for 3.38 percent of all infections.

In collaboration with ICIPE, PPI scientists are identifying, cataloguing, and characterizing in Southern and Western parts of Ethiopia the various trypanosome species, and drug resistance and polymorphism in *G. pallidipes*.

Currently, the Ethiopian Science an d Technology Commission (ESTC) and the regional government in collaboration with ICIPE have initiated pilot trials in several parts of the country (i.e. Oromia, Amhara, Beles Valley, Tigrai etc) As a result, ICIPE cooperates and provides support or

reinforcement to the partners in order to have a sustainable community based tsetse control program in Ethiopia.

In order to reassure the sustainability of the pilot control program, three major approaches have been developed that include the following:

- The ESTC, in collaboration with ICIPE and other relevant institutions, provides traps for validation, testing, and training from its regular research and development promotion fund.
- For the next few years, the regional Agricultural Bureau and the development associations will provide 2,000-3,000 traps from the regular disease control budget, from local and from external contributions totaling approximately US$ 100,000.
- Ultimately, the community has the responsibility to sustain and to extend the operation through their own resource mobilization and income generation systems. For instance, the Guarage Community, has cultivated 40 hectares and produced 10-15 metric tons of teff that will be sold commercially for purchase of materials to make over 2,000 traps. Similar activities are devised by different peasant associations in the study area.

Therefore, this pilot project has successfully demonstrated that the communities are able and willing to carry out tsetse control. In addition, in close consultation with the community a robust and eight-fold cheaper than the standard traps has been developed and tested for a much wider use.

As a result of this project the farmers have been requested to initiate an integrated program that can address most of their problems in their area. After a series of discussions, the concept of Biovillage initiative emerged.

BioVillage Initiative

It is a holistic community-driven integrated approach combining several strategies aimed at addressing economic development problems of rural communities in Ethiopia. It embraces strategies aimed at improving human, animal, and plant health and integrated initiatives and projects intended to catalyze and exploit incoming-generating potential. It also aims at developing the capacity for sustainable implementation of development initiatives through efficient resource utilization and conservation. The specific long-term objectives of the initiative are improvement of human, animal, and plant health through preventative pest and vector control methods. Initiation of sustainable development through better resource management techniques: and alleviation of poverty through the broadening of the income base of the community.

The BioVillage model seeks to achieve the following objectives:

- to improve human and livestock health by integrating primarily preventive vector control methods. This involves the community in (on-going) constructing insect-proof tukuls for the livestock and the villagers. The donor will stock the BioVillage with the contribution of several hundred high quality livestock (mainly Boron dairy cows) and non-traditional building materials;
- to initiate sustainable development by integrating resource management techniques; for example, to provide biogas for community needs, including energy for eventual cottage industries, thereby reducing/eliminating reliance on firewood;
- to alleviate poverty by laying the basis for a diverse range of income generating activities;
- to build the capacity of the community and promote the concept for further application.

The Overall Goal and Expected Benefits

The overall goal of the BioVillage Initiative is to catalyze economically and ecologically sustainable development of the rural economy in Ethiopia through the improvement of food security and the health status of the community (its crops, livestock, and the overall environment) and the development of relevant capacity. It is expected that within the first two to three years of the project period, tangible gains will already have been made in these areas. Specifically, the Initiative is expected to result in the following:

- reduction of incidences of malaria, trypanosomosis, and tick-borne livestock diseases;
- reduction of helminthiasis and filth fly-borne diseases;
- increase in food and fodder production because of better pest management and improved crop management;
- increase in energy and fertilizer production using biogas digestors, leading to conservation of the environment;
- improve health leading to a perpetual dynamic socio-economic development;
- the basis for increase in income-generating activities; and
- overall improvement in the quality of life.

The capacity of the community to implement economic development programs is expected to enhance significantly by the end of the project period.

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International Centre for Insect Physiology and Ecology (ICIPE)

IPM Practitioners and Their Needs: Ghana

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Introduction

Small scale farmers are the main pillars of Ghana's agricultural production, producing over 90 percent of the country's food crops. Consequently, the medium term Agricultural Development Program (MTADP) of the country focuses attention on increased small holder productivity for food crops through expansion of area cultivated, increased research, efficient supply and utilization of inputs and strengthening of the agricultural extension services.

An FAO Technical Cooperation Program (TCP)-funded Pilot Project on Implementation of Integrated pest Management (IPM) in rice was conducted at an irrigation project site, Dawhenya, in the Dangbme West District of the Greater Accra Region of the country. At Dawhenya, 24 field extension staff of the Ministry of Food and Agriculture (MOFA), were trained in a season-long Training of Trainers Course (TOT) on participatory IPM in rice. As part of their training, participants conducted three farmer field schools (FFS) involving 75 rice farmers. Farmers compared IPM plots with plots treated with the conventional package of agro-chemicals recommended for rice production. Yields on the IPM plots were higher than those on the reference plots. Savings on pesticide inputs amounted to US$100 per hectare on IPM plots. As a result, net returns from IPM plots were 32 percent higher than returns for reference plots. The pilot project demonstrated that the IPM/FFS training methodology, which had been developed in Asia, could be adapted to West African conditions.

Subsequent follow-up FFS training was conducted at five other irrigation project sites with the aim of extending the Dawhenya experience to other regions or ecologies to train additional rice farmers. Average yields went up to around 6t/ha from just over 3t/ha. Average net returns of FFS trained farmers on IPM plots were 24 percent higher than returns from reference plots maintained by the same trained farmers who did apply the cultural and agronomic practices learned during the FFS, but also continued with the prescribed spraying program.

The results of these training activities convinced the relevant government authorities that the IPM/FFS should be scaled up and made available to groups of farmers.

Current Status of IPM in Ghana

IPM Stakeholders

In the present case study, IPM stakeholders are considered to include the following:

- Farmers,
- Extension Agents of MOFA,

- Researchers,
  Intermediaries — NGOs, International Research Centers.

UN Agencies and Donors

Policy Makers

As indicated by Van Huis & Meerman earlier on during this workshop, many people consider IPM as equivalent to using correct pest management practices. Even chemical options that should be termed pesticide management, are often presented as IPM. The confusion may be partly due to a changed perception of IPM from a technological into a methodological concept. Thus, in Ghana today, we have a mixture of three different groups of people following the three levels of integration in the history of IPM: (1) Combining control methods and reducing pesticide applications, (2) Integrating control method into farming systems, and (3) Developing IPM with the participation of IPM at the farm level (FAO, 1968; Brader, 1991; FAO, 1984; Chambers and Jiggins, 1987; Schulten and van der Graaf, 1988).

NARS/NARP

Since 1990-1991, Ghana's Agricultural Research System has been restructured with the establishment of the National Agricultural Research Project (NARP). NARP comprises all institutions engaged in agricultural research in Ghana and include the following: Faculties of Agriculture in the Universities, research institutions under the Council for Scientific and Industrial Research (CSIR), the Ministry of Food and Agriculture (MOFA), and farmers. Under the NARP, commodity-based multidisciplinary and inter-institutional research teams are in place. Research is usually adaptive, with farmers on farmer's fields, but there are also some basic research activities, especially in the Universities. Each of these commodity-based research teams has some of the scientists concentrating on IPM issues, which usually emphasize pests/diseases identification and control with pesticides — calendar or "need-be" spray schedules, cultural practices, and use of resistant varieties of crops.

Scientists on these teams also serve as resource persons in IPM/FFS/TOT programs.

NBCC

The National Biological Control Committee (NBCC) was formed around 1992 to address biological control based IPM interventions. This was established with a three-year grant from the Austrian Government through IITA, but now funded by the Ghana Government. This committee is also multidisciplinary with various working groups. Targeted crops are cereals, vegetables, larger grain borer, Zonocerus grasshopper, mango mealybug, and the water hyacinth.

NICPAC

Prior to the FAO/TCP in rice IPM, a National Integrated Crop Protection Advisory Committee chaired by a Deputy Minister of Food and Agriculture was established by the government in April 1995. This committee, which is an advisory body on all IPM issues, is made up of policy makers, researchers (from the Universities and Research Institutions), farmer organizations, the Environmental Protection Agency, extension agents, and farmer associations.

With time, the Committee has fully endorsed the IPM/FFS training strategy and has recommended to the Minister of Food and Agriculture to adapt it as an extension tool in training of extension staff and farmers. Integrated crop management strategies have been the central theme of this committee's recommendations.

Institutional Framework

In recognition of the validity of the IPM/FFS approach, the Minister of Food and Agriculture, institutionalized the Project Oversight Committee (POC) in May 1997 to facilitate the expansion of IPM/FFS in Ghana. The POC is chaired by a Deputy Ministry of MOFA and includes the Director of all the relevant departments of MOFA, Head of NARP, representatives from the Environmental Protection Agency and NGOs. A professor from the University of Ghana was appointed the National IPM Coordinator and acts as secretary to the POC. The Senior Crop Protection Officer, at the FAO Regional Office for Africa, in Accra, Ghana, is an advisor to the POC.

Networking

In line with the government of Ghana's recent decentralization exercise, the POC has recommended the establishment of regional and district oversight committees throughout the country to supervise all IPM/FFS activities. Regional MOFA directors are to chair those committees, with representatives from farmers, NGOs, researchers, and extension agents. District directors (MOFA) of all districts with IPM/FFS activities are to be members. The National IPM Coordinator will then link up with these committees to form a national IPM net work.

Coordination

With the appointment of a National IPM Coordinator, a secretariat has been established for him at the Plant Protection and Regulatory Services department of MOFA. This secretariat is equipped with computers, an administrative assistant, telephone, one cross country vehicle and a driver.

It is very necessary to connect this secretariat to the Internet, so it could be the main Internet access to be linked with the regions, the universities and research institutions. Currently, coordination is achieved by regular visits to all regions, personal and telephone contacts with POC/NICPAC members, and sometimes by mail correspondence. Workshops, occasional lectures and publicity in both the print and electronic media have also been used.

The NGOs in Ghana have recently formed an action group, with a representative on the POC. Each of the three Zonal contact points invite the National IPM Coordinator to their meetings and workshops.

E-mail Connectivity

All the CSIR Research Institutions (except SARI — the Savannah Agricultural research Institute — at Nyakpala, Tamale) and the Faculty of Agriculture in the Universities, have been connected toE-mail by the USAID AfricaLink project through the West Africa Rice Development Association (WARDA): These are in Accra, Cape Coast, and Kumasi.

Some projects have also connected their local collaborators:

- Bean/cowpea CRSP — Kumasi/Tamale
- IITA/WAPP — Accra
- GTZ/MOFA-ICP — Accra, Sunyani
- NGO's — Accra, Kumasi, Sunyani
  FAO — Accra

Information Needs

To be able to address all the needs of farmers to produce healthy crops a holistic approach to information generation and presentation is required to cover the following aspects:

- **Agronomic** — Seed, land preparation, nursery practices, soil fertility and amendments emphasizing organic/composting, cropping systems, population densities and other farm management practice.
- **Socio-Economic** — Labor, marketing and credit facilities, processing and farm produce, gender issues, and so on.
- **Training** — Participatory approaches, non-formal education strategies.
  Protection — Pest /diseases and their natural enemies, identification and recognition, biopesticides and so on.

Specific Needs of Stakeholders

Researchers

- Non-formal education techniques
- Team work/multidisciplinary approach for holistic information gathering
- Connectivity to E-mail to link IPM secretariat
  Use resource persons in IPM/TOT/FFS.

Policy Makers

- - Sensitization of IPM issues.
- - Invitation to workshops, field days, FFS days
  - Connectivity to E-mail for linkages.

Extension Agencies

- - Training as facilitators —TOT.
- - Non formal education technique
- - Communication skills
- - Motivation/incentives/recognition and rewards for hard work
  - Connectivity through Regional and district offices

Farmers

- - Training to become experts
- - Recognition/acceptance of indigenous knowledge
  - Involvement in information gathering.

IPM Coordinator

- - Management/Coordination techniques

- - Flexibility and accessibility to all
- - Mobility
- - Non formal education techniques
- - Project proposal/monetary and evaluation techniques
- - Internet and E-mail connectivity for ease of access to information
  - Linkages with all stake holders, local and international collaborators.

NGO's

- - Participatory approaches
- - TOT strategies in IPM/FFS
- - Connectivity to E-mail
- - Motivation/incentives
- - Donor support
- - Linkages with national programmes and with other NGOs
  - NGOs to form own network

Overall Strategy

The IPM/FFS strategy for enhancing crop production practices in the country is being developed in pilot cases. The idea is not to stop on-going training approaches, nor to swallow existing practices, but to perfect and consolidate them into our system. For sustainability, emphasis is placed on use of local expertise and to improve on our own human resources. We are therefore open to all collaborative but not dominant partners. The Global IPM Facility, FAO, Rome, and CABI Biosciences are currently providing technical backstopping.

Several other IPM projects are ongoing in Ghana: These include projects on Cowpea (USAID), Striga Control (GTZ), Cassava and Plantain (IITA), Integrated Crop Protection (GTZ/MOFA), and Integrated Food Crop System Project (NRI/NARP).

Most of these projects are still research-oriented and seem weak on participatory extension. The IPM/FFS training methodology is expected to add value to those. A national mechanism for cooperation and coordination among IPM initiatives is envisioned to be established under the National IPM Program.

The main target crop for IPM/FFS has been irrigated rice. Further pilot activities on IPM/FFS for cassava and cowpea conducted by the 1995 Rice TOT graduates (Cassava: ESCAPP-IITA, Cowpea: USAID Bean-Cowpea CRSP) in 1996, demonstrated that IPM/FFS has great potential to add value to these on-going projects. Since October 1997, pilot IPM TOT/FFS on plantain has been on-going at the University of Ghana's Agricultural Research Station at Kade, with resource persons from ARS Kade, Crops Research Institute, IITA/West African Plantain Project, and PPRSD (MOFA).

As a foundation for a larger scale National IPM Program (funds being solicited), the UNDP /NPRP-IPM/FFS, is to upgrade the agro skills of rice (irrigated and upland) and vegetables (tomato and cabbage) farmers and extension agents of MOFA, using the IPM/FFS training methodology. The project covers a period of three years — September 1997 to August 2000.

Immediate Objectives, Outputs, and Activities

Immediate Objective 1

Extension capacity to train about 1,400 farmers annually in Farmer Field Schools.

Output 1. Report with base-line data on vegetable production (tomato and cabbage), farmer practices, production, and possible IPM solutions.

Activity 1. Survey of crop problems and farming practices (1-2 month field tour to interview farmers and extension staff; identification of pests and natural enemy populations; etc.).

Activity 2. Inventory of available information on IPM strategies regarding tomatoes and cabbage.

Output 2. Training curriculum for Training of Trainers for IPM/FFS on tomato and cabbage.

Activity 1. Study tour (4 weeks) for NPC and two selected trainers to an Asian country where a TOT on vegetable IPM is being conducted.

Activity 2. Workshop (3-5 days) on non-formal education techniques for resource persons.

Activity 3. Small workshop to design on-farm experiments for testing validity of potential IPM interventions. This activity will be conducted with assistance of an international consultant.

Activity 4. Curriculum development field activity: Farm-based experiments (4-6 months) to test and adapt theory and foreign experience to actual farm situations in Ghana. This activity will be conducted by future master trainers and selected farmers with involvement of researchers.

Activity 5. Workshop (10 days) to develop training curricula for IPM/FFS on tomato and cabbage, involving farmers, trainers, researchers and consultants.

Output 3. Up to 55 trained extension staff capable of conducting Farmer Field School: about half of them specializing in rice and half in vegetables.

Activity 1. Season-long TOT on rice at Dawhenya. Twenty-five extension staff will be trained on IPM/FFS rice. There will be one master trainer from Asia and four from Ghana.

Activity 2. Season-long TOT on vegetables (tomato/cabbage). Thirty extension staff will be trained on IPM/FFS vegetables. There will be two master trainers from Asia and two to three from Ghana.

Activity 3. Post TOT follow-up activities. TOT graduates within a district meet monthly to discuss progress in their FFS.

Immediate Objective 2

Small-scale farmers should be empowered to make crop management decisions by themselves based on an understanding of the agro-ecosystem and economy of their fields and capable of growing a healthy crop with a minimum of pesticides and minimum dependency on research and extension services.

OUTPUT 1. About 1,700 farmers trained during season long FFS by the end of year 3.

Activity 1. Training of small scale farmers in about 80 season-long FFS.

Activity 2. Formation of groups of trained farmers. Follow-up visit by extension staff (e.g. for facilitated self-evaluation meetings).

Activity 3. Impact studies to monitor the impact of FFS followed by adjustment of FFS training programs where necessary.

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Role of Information in IPM Farmer Field Schools: Experiences in Kenya

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Introduction

In the central highlands of East Africa, cash crops such as coffee, are grown in mixed cropping systems with a variety of food crops, fodder, and fruit trees (Njoroge and Kimemia 1993; Nyambo, personal observations). Recent studies have shown a dramatic increase in the use of pesticides by small-scale farmers (Dickinson et al, 1984; Maroko, 1987, 1989, and 1991; Mwanthi and Kimathi, 1990; Michalik, 1994; Ngatia et al, 1994; Nyambo et al, 1996a), this leading to increased concern about the escalating costs of production, reduced farm , and an increase in health and environmental risks. The costs of agrochemicals (fertilizers and pesticides) absorbs a large proportion of farmers' income (Nyambo, et al, 1996a), but the farmer is faced with little choice due to the lack of readily available alternative crop management options to improve production on sustainable levels. Cost effective and environmentally friendly pest (insects, diseases, weeds, nematodes) and soil management options are needed to reduce over dependency on synthetic chemical inputs, improve the sustainability of crop production and farm , and reduce potential health and environmental risks.

Sustainable methods of soil and other resource management, including crop plants and their pest problems as well as their potential natural enemies, are the focus of farmer participatory integrated pest management (IPM) as an approach to improve agricultural productivity. This holistic approach can lead to lower costs of production in terms of synthetic pesticides and inorganic fertilizers and so improve farm income.

To this end, a pilot farmer participatory IPM training project in coffee and vegetable small scale farming systems was initiated the Central and Coast provinces of Kenya in 1995. Its aim was to introduce farmer participatory IPM implementation in cropping systems, which have been shown to be using excessive amounts of chemical pesticides. The project focused on developing farmer participatory training methods for farmers in small scale mixed cropping systems, and drawing upon the methods developed in the successful farmer field schools (FFS) approach to IPM pioneered on rice in Asia (Kenmore, 1996). Farmer field schools (FFS) are an informal farmer driven "bottom-up" education approach, which emphasize farmer empowerment through participatory technology development and transfer as well as the acknowledgement of the indigenous knowledge of farmers and their experiences.

Training Methodology

The traditional extension system in East Africa is based on a "top-down" approach, with emphasis on delivering pre-designed messages/packages. The packages are usually formulated by a researcher and delivered to the subject matter specialist at the regional/district extension level for packaging and delivery to farmers. In this system, the extension agent is an instructor, and the farmer is expected to follow the instructions. This "top-down" and decentralized decision-making approach ignores existing farmer knowledge and skills in crop production, resulting frequently in limited adoption of research recommendations. For farmers to adapt IPM approaches, they need to understand the basis from which the technology was developed. The FFS approach offered the opportunity through which the key stake-holders (farmers, extension workers, and researchers) interacted as partners to develop IPM options.

Sources and Types of Information Used

The training curriculum for the FFS was based on the local crop production problems in the system so as to generate relevant locale specific technologies. The technologies were developed using a variety of information sources, which included:

- Farmer knowledge (farmers' experiences in farming) through sharing, analysis, and group dynamic exercises
- Research findings (scientific knowledge) from the national programs as well as from International Institutions. This was achieved through literature search (CABI-CD ROMs, gray literature, etc., research-farmer group discussions (special topics), farmer experiments, and visits to research stations.
- Networking. This involved local (through exchange visits between FFS group as well as word of mouth through the master trainers) and International (with other FFS trainers in Asia and Ghana) information exchange through mail, newsletters, workshops, etc.
- Videotapes (based on the Asian FFS approach) and slides based on local cropping systems.
  Mass media (TV, radio programs, local daili,es and newsletter) as well as farmer-farmer contacts were used to disseminate information from the FFS groups to others.

Modes of Information Generation, Sharing, and Dissemination

The stake-holders interacted as partners during FFS sessions to generate and develop appropriate IPM options through a combination of the following avenues:

- Discovery learning (farmer experimentation),
- Exchange visits between FFS groups,
- Use of local languages for training in FFS sessions,
- Information sharing through group discussions and plenary sessions,
- Use of slides, videos, and posters,
- Use of live specimens collected by the FFS participants from their fields,
- Drawings by FFS participants, and
- Use of the local mass media (TV, dailies, radio programs, and local newsletters)

Drawing, which was found effective in the Asian culture, was not well received by the participants, and use of live specimens gradually became more popular with the FFS groups. This was partly because many of them could not associate the sketch drawings with the real insect or animal, which constrained their learning.

Stake-holder Information Needs

All the stake-holders were involved in planning and implementation of the FFSs. However, with time, it became clear that the information needs as well as the mode of sharing between them differed depending on their backgrounds (Table 1). Whereas some of the problems were addressed during the training period, some e.g. reversal in attitudes and perceptions, needed time and more training for the necessary changes to occur.

Table 1. Stake-holder information needs and mode of sharing

Stake Holder	What Do They Have	Needs	Mode of Sharing
Farmers	● Indigenous knowledge ● Farming experiences	● Appropriate information on knowledge gaps	● Informal farmer-farmer discussions ● Practicing IPM on their farms (experimentation)

Extension workers	● Basic training in general agriculture ● Experience in the national extension system ● A course in community participatory approaches to extension ● Basic IPM training	● A range of locale specific IPM options ● A reversal of attitudes and perceptions	● Informal discussions with farmers and their superiors ● Formal meetings with colleagues and their superiors
Researchers	● Specialized training ● Skills in experimental designing ● Access to a wide range of information technology ● Access to scientific research facilities	● Reversal of attitudes and perceptions ● Training in communication skills	● Verbal by participating in FFS sessions ● Formal meetings with their colleagues

Constraints

Although the program developed and tested a curriculum for training of trainers and farmers in IPM approaches, which captured the imaginatio, and attention of the participants, information flow between the stake-holders was hampered by the following:

- Lack of relevant audio-visual aid facilities (TV, video-recorders, slide projectors, and electricity) at village level for use in FFS sessions. It was possible to show slides and videos to the ToT trainees during the residential course only.
- Language barrier. Although local languages were used in all FFS sessions, these have limited vocabulary for insects and plant diseases. In addition, the existence of dialects within different languages made information exchange without the help of live specimens difficult.
- Lack of appropriate communication skills. Resource people as well as some of the trainers lacked farmer friendly languages and, therefore, could not share their knowledge adequately with the farmers. The attitudes and perceptions of researchers and extension workers were great barriers as they still maintained a top-down approach and often failed to recognize farmers' knowledge.
- Cultural taboos and norms that hinder information flow between different age groups and gender.
- Literacy level. This affected the access to mass media facilities and also the level of understanding of the message contained.
- Inadequate infrastructure (telephones, mailing system, funds etc.) for local networking. Information exchange between the FFS groups has come to a stand still since the demise of the pilot project in September 1996.
- Inadequate training in IPM approaches for the extension workers.
  Conservatism and over protection of information by some stake-holders

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Integrated Pest Management Information Exchange and Challenges in Uganda

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Introduction

Agriculture, which is the backbone of Uganda's economy is in a state of transition; shifting from subsistence to commercial agricultural production. The government's policy of Agricultural Modernization is emphasizing use of modern methods of production, including pest management, to increase productivity. As it is already known, intensifying agricultural production is associated with increased pest outbreaks, which necessitate control to reduce crop losses. The methods of pest control currently available to farmers are use of chemical pesticides and cultural practices. However, because of lack of reliable information on cultural control practices, government agricultural extension services tend to recommend use of insecticides alone. Consequently if no measures are taken to develop and disseminate Integrated Pest Management approach, modernizing agriculture in Uganda is going to increase the use of pesticides and their attendant problems.

Fortunately, use of pesticides on crops is still very low (Meltzer et al 1994), although there are substantial amounts being used in coffee, cotton, banana, groundnuts, and horticultural crops. According to Meltzer et al (1994), even at the low levels, there are problems with use of pesticides that include lack of information, illiteracy, and unavailability. Furthermore, methods of application are, in a majority of cases, unsafe; using wrong equipment and without wearing proper protective clothing.

The above scenario, therefore, sets a proper stage for development of IPM strategies that would minimize pesticide application and that are socially acceptable. This process, certainly, requires information exchange on various aspects of IPM. This paper, therefore, identifies the major players in development and utilization of IPM strategies in the country; it highlights IPM information needs and IPM information exchange system between various stakeholders. It also discusses what ought to be done to improve IPM information systems.

In order to address the above issues appropriately and without personal bias, a questionnaire was administered to 18 scientists involved in IPM research and extension. In the questionnaire, data on how IPM information are received and disseminated were gathered. The media of communication and their availability were also established.

IPM Stakeholders

IPM stakeholders in Uganda can be grouped into three categories, the technology generators, the users, and IPM sponsors.

IPM technology generation in the country is the domain of the National Agricultural Research Organization (NARO) and Makerere University. The contribution of International Agricultural Research centers is usually channeled through NARO or Makerere University. Examples of international agricultural research centers and scientists working in Uganda include, IITA, CIP and ICRISAT and GTZ-horticulture based in NARO, and IPM/CRSP based at Makerere but collaborating with NARO.

NARO was established in 1992 to bring under one management research in crops, livestock, fisheries, and forestr. It is responsible for research and development of sustainable pest and disease control technologies. The organization has five institutes conducting crop-IPM related research, and are, Kawanda, Kituza Nakawa, Namulonge, and Serere.

Kawanda Agriculture Research Institute (KARI) is responsible for research on bananas, storage pests, and horticultural crops. Nakawa Forestry Research Institute (FORI) is responsible for plantation and natural forests. Kituza Coffee Research Institute (COREC) is for coffee. Namulonge Agriculture and Animal Research Institute (NAARI) is responsible for research on beans, maize, root crops, and biological control in general. Serere Agricultural and Animal Research Institute (SAARI) conducts research on cereals, grain legumes, oil crops, and cotton.

The Faculty of Agriculture and Forestry, Makerere University, besides teaching IPM to under-and post-graduates, is mandated to conduct research on any crop as long as funds are available. Table (1) gives number of scientists involved in IPM research in the crop based institutes.

The main users of the IPM technology are the farmers, through the Ministry of Agriculture Animal Industry and Fisheries (MAAIF) and NGOs who disseminate the information.

MAAIF has directorates of extension and crop resources that post Subject Matter Specialists (SMS) to districts to assist in information dissemination. Below SMSs are Field Extension Workers (FEW), who are at sub-county level. The FEWs are supposed to extend all aspects of agriculture to the farmers.

The largest NGO in dissemination of pest managementiInformation is the Uganda National Farmers Association (UNFA). This, unfortunately, has almost put up a parallel extension service to that of the MAAIF. Other NGOs include, among others, World Vision, CARE, and Action Aid who occasionally participate in information dissemination.

Table 1: Human Scientific Capacity Involved in IPM Research in Different Research Institutes

	NARO			**Makerere University**	
Speciality	**KARI**	**NAARI**	**SAARI**	**FAF**	**Total**
Entomologists	6	5	3	2	16
Pathologists	7	3	3	2	15
Extension Liason	1	1	1	—	3
Nematologists	2	0	—	—	2
Weed Scientist	0	1	2	1	4
Total	**16**	**10**	**0**	**5**	**40**

IPM Research

Until 1994, research on IPM in the country was fragmented and lacked a focused approach (Kyamanywa 1996). In 1994, however, two important things happened in Uganda that have influenced IPM research and development. In 1994, NARO recognized the role of IPM approaches and contracted a consultant to review it IPM related activities. The consultants' report exposed a number of issues and resulted in establishment of IPM as a separate program. The other important activity that took place was holding of a one day IPM stakeholders' meeting sponsored by the IPM/CRSP and facilitated by the Ohio State University. In this meeting, the problems of IPM research, development, and application were identified, and a Ugandan IPM-Network was formed. Since these activities, there has been a new sense of direction in so far as IPM research is concerned (Kyamanywa 1996). A number of well focused IPM research activities are being conducted at KARI, NAARI, SAARI, and Makerere University. It is not possible to go into details, but it is appropriate to highlight the participatory IPM research activities, sponsored by IPM/CRSP, which are going on in the various institutions and are summarized in Table 2.

Table 2: IPM/CRSP Activities at Different Research Institutions.

Institution	**Program Activity**	**Lead Scientists Involved**
KARI	Integrated management of storage pests of cowpeas and beans	Mr. A. Agona, Dr. H. Willson, Dr. M. Erbaugh

NAARI	Integrating intercropping and resistance in control of stalkborers	Dr. G. Bigirwa, Dr. S. Kyamanywa, Dr. H. Willson, Dr. H. Warren
MUK	Determination of stalkborers and termite damage/yield relationship Integrated management of bean fly on beans	Dr. S. Kyamanywa Dr. H. Willson Dr. S. Kyamanywa, Dr. H. Willson
SAARI	Integrated management of striga in sorghum and millet Integrating cowpea promising varieties with minimum insecticide in controlling cowpea insect pests Integrated management groundnut aphid	Dr. J. Oryokot Dr. Brhane Gebrekidan Dr. S. Kyamanywa Dr. H. Willson Dr. G. Epieru Dr. H. Willson

Because of this deep involvement in research in different institutions, IPM/CRSP has developed and maintained a net-work of IPM scientists who are closely linked, and this has facilitated information exchange.

IPM Information Acquisition

Table 3 shows what the IPM scientists in Uganda consider as the popular ways of acquiring IPM information. Published journals were most popular, followed by annual reports, then CD-ROM, the Internet, and Newsletter and personal communication as the least popular methods.

Table 3: Sources Used by Scientists in Uganda to Acquire IPM Information

Source of IPM	Percentage Using Method	Mean Ranking Score*
Journals	91	1.0
Annual reports	71	2.0
Internet	16	5.0
CD-ROM	16	4.5
Newsletter	16	5.7
Personal communication	16	5.8

*Score 1 = most important and 6 = least important

IPM Information Exchange

Workshops, conferences, seminars, and newsletters were considered as the most prevalent ways, in descending order of importance, of

information exchange (Table 4). Only two scientists out of the 18 surveyed, considered using the internent as a good medium of information exchange.

Table 4: Methods of IPM Information Exchange Used by Scientists in Uganda

Method	% Mentioned the Method	Mean Ranking of the Method*
Workshops	83.3	1.6
Meetings	33.3	4.8
Seminar	66.6	3.9
Internet	16.7	6.0
Conferences	90.1	2.0
Newsletter	58.3	4.4

*Score 1 = most important and 6 = least important

Availability of Computers, Telephone Lines, and Internet Services

Out of 40 scientists, involved in IPM and related research, only 17 (42.59%) own computers. Of these, only 7 (41.1%) have telephone lines in their offices. All those with telephone lines were connected to e-mail services, and 50 percent have full internet service (Table 5).

Table 5: Availability of Computers, Telephone Lines and Connectivity to Internet of Major IPM Stakeholders

Institution	Scientist with individual access				Assess through institution to arrangement			
	PC	Tel. Line	E-mail Connection	WWW Connection	PCS	Tel. Connection	E-mail Connection	WWW Connection
FAF (crop science)	5	3	3	2	4	1	0	0
NAARI	5	1	1	1	3	1*	1	0
SAARI	0	0	0	0	0	1	0	0
MAAIF	0	0	0	0	0	1	0	0
FOR	4	0	0	0	4	1	1	1
KARI	3	3	3	0	15	1	1	1
Totals	**17**	**7**	**7**	**3**	**28**	**6**	**2**	**1**

*Institutional connection has problem of telephone service

It is clear from the above that there is still limited use of internet and few scientist are connected to telephones and have computers.

Usefulness of Internet in IPM Information Exchange

In the present survey, 60 percent of those connected to the internet indicated they had not found the internet very useful in IPM information

exchange (table 6). The only scientist who indicated that she was very comfortable with the internet in IPM exchange was a scientist from CIP. This suggested that she was well exposed and had the know how. One the other hand, however, all the scientist with e-mail access found it very useful.

Table 6: Usefulness of Internet in IPM Information Exchange

Usefulness of Internet in IPM Information Exchange	Number of Responses
Not useful	2
A bit useful	4
Very useful	1

Strengthening IPM Information Exchange

The scientists were of a strong view that having regular Forums for exchanging ideas was the best way of strengthening IPM communication (Table 7). Increasing circulation of publications, reports and newsletters was also viewed as the second important way of information exchange.

Table 7: Ways Suggested by Scientists for Strengthening IPM Information Exchange and Communication

Proposed Method	Percentage of People Suggesting the Method
1. Strengthening IP Networks	8.3
2. Having a forum for regular exchange of ideas	58.3
3. Increased circulation of publication, reports, and IPM newsletters	33.3
4. Available funds for reprints and subscription to journals	8.3
5. Establishment of special IPM section	8.3
6. Use television and radio programs	8l.3
7. Increase internal connectivity	25.0
8. On-farm trials and extension	8.3
9. First identification of what information to exchange	17.0

Discussion

This case study has shown that electronic communication is still at a low level of utilization in the country. Workshops, meetings, conferences, reports, and journals were still the popular ways of communicating IPM information. Therefore, in the short-run they should be maintained and strengthened.

The low level of utilization observed is not necessarily an indication of dislike for the internet. It is a reflection of technical and logistical problems. These include limited computer availability, limited telephones access and poor telephone lines, and lack of funds. If these obstacles are addressed, then utilization of the internet is going to increase.

Another problem, which was observed from those who are connected, is failure to exploit the technology fully. Few scientists knew exactly what they could get from the internet and how to cut on expenses during searching. This is a problem that I believe is easy to address, and this workshop is doing that. Furthermore, the few connections are also not properly exploited by having other computers connected to the same source.

In trying to identify ways of strengthening IPM information exchange, two respondents pointed out a crucial issue that perhaps ought to be discussed in this workshop: What information do we exchange? In my view, this is a fundamental question that may have hindered and still continue to hinder IPM information exchange in Uganda and requires addressing.

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International Centre for Insect Physiology and Ecology (ICIPE)

Integrated Pest Management in Zambia: The Status of Information Access and Exchange

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Introduction

The socio-economic and environmental considerations and the inherent inadequacies of the traditional singular approaches to pest management is increasingly making integrated pest management (IPM), the inevitable rather than alternative choice. In Zambia, farmers are generally grouped into three categories: resource poor small scale, emergent, and commercial. The ability of individual farmers to make pest management decisions is largely dependent on education and socio-economic factors. The country's need to pursue IPM approaches is precipitated by a number of pressing pest management related problems. The recent spread of the Larger Grain Borer (*Prostephanus truncatus* Horn) is seen as a major threat to national food security. Pesticide resistance is suspected in a number of major vegetable pests. Due to ignorance leading to non observance of pre-harvest intervals, cases of human poisoning from consumption of pesticide contaminated vegetables have been reported and appear to be on the increase (Chipungu and Kunda, 1994; UTH,1997). Indiscriminate routine pesticide spraying regimes, despite established IPM packages in crops like cotton are a source of concern. There are currently a number of on-going initiatives employing IPM concepts aimed at solving these problems.

While there is great willingness to promote IPM by practitioners, timely and cost-effective access to crop and pest/disease specific information is often a major limiting factor. Current methods of information exchange are mainly by publications, telephone, fax, radio, television, and training workshops. The cost of operating these modes of communication, when dealing with vast amounts of information is largely prohibiting. For example, sending a one page fax to the United States will cost $5.50. To deliver the same amount of information by telephone may cost up to three times the fax charge, while only about $1 can be spent using e-mail. While these types of communication are to continue playing a vital role in the flow and exchange of IPM information, there is an obvious need to gain access to more versatile, speedy, and cost effective means of acquiring and exchanging this information.

IPM Activities and Achievements

Government policy is committed to the promotion of IPM strategies in order to protect the environment and to offer sustainable solutions to a number of pressing pest problems. IPM approaches incorporating host plant resistance, use of microbial agents, cultural control, and use of natural enemies have produced good results in a number of important pest/disease problems. Potato tuber moth (Phthorimaea opereulella Zell) has generally remained suppressed after mass rearing and release of two natural enemies *Copidosoma koehleri* and *Braconi greeni*, together with a combination of cultural methods (Mingochi et al 1997). Use of cultural methods and resistant varieties has been successful in combating Blackrot (*Xanthomonas campestris*) a serious disease that highly reduces production of cabbage (*Brassica oleracea* var. capitata) and rape (*Brassica napus*) in the rainy season. Zambia is currently participating in a Southern African community/Asian Vegetable Research and Development Center's (SADC/AVRDC) Tomato Improvement Collaborative Research network for the Highlands of Africa, which aims at incorporating host-plant resistance to important diseases such as bacterial wilt and tomato mosaic virus. The vegetable research program has drawn a profile of important vegetable pests and diseases, specific to crops, seasons, and how various pest management methods can be combined. The bionomics of major

cotton pests and their economic thresholds have also been worked out. However, there is still over dependence on insecticides due to limited IPM knowledge on the part of extension agents and farmers. The cassava mealybug (*Phenacoccus manihot*) (Homoptera: Pseudococcidae) has been suppressed by mass field releases of a natural enemy (*Epidinocarsis lopezi*) . Field surveys are carried out to monitor field establishment and performance. IPM approaches being employed to tackle the threat from the larger grain borer include use of improved storage structures, biological control using a predaceous beetle (*Teretriosoma nigrescens*), chemical admixes for stored grain and general storage hygiene.

Despite these achievements, there still exists a number of vexing pest problems facing the country. Pesticide resistance is suspected in important pests like diamondback moth (*Plutella xylostella* L.) and red spidermites (MAFF 1997; ESZ 1994). The reported increase in cases of pesticide poisoning is probably linked to desperate efforts by farmers to control these pests.

Successful results from use of IPM techniques in Zambia, demonstrate the great potential of this approach for pest management. There still, however, remains the challenge of transferring the information from the generators to the extension agents and ultimately to the farmer. Print-based research databases ,which include plant protection work is currently being computerized into a Research Data Archive. Once completed and distributed this will provide a useful source of locally-based knowledge that can be accessed by extension workers. There are a number of organizations such as the Integrated Crop Management/Food Legume Project that are involved in the promotion of sustainable agriculture in the country. Promotional activities cover organic farming, use of natural pesticides, minimum tillage techniques, and training of farmers. The flow and exchange of information through the existing institutional framework is best described as sporadic.

IPM/Sustainable Agriculture Networking

The formation of a national IPM/sustainable agriculture is recognized as vital in forging better linkages between IPM stakeholders in the country. Government realizes the need for closer collaboration between various local and international institutions involved in the generation, transfer, and utilization of IPM information (MAFF, 1994). Government research/extension agencies, the National Farmers Union, the University of Zambia, farmer training centers, such as Kasisi and Riverside, as well as non governmental organizations (NGOs) like CARE-Zambia, that are directly working with farmers would form the backbone of the network. Subject to the availability of resources, a national workshop that will bring together possible collaborators is recommended.

The IPM network would aim to provide a speedy flow of information and exchange of ideas between collaborators in order to enable IPM practitioners to access and make practical use of the information at the time it is needed. While traditional forms of communication, particularly radio and television can still play an important role, the use of computer-mediated communication is pivotal to the success of the network. This mode of communication would enable the network to initiate linkages that will exploit IPM databases offered by regional networks like the Southern Africa Coordinating Center for Agricultural Research (SACCAR), international research centers like International Center of Insect Physiology and Ecology (ICIPE), the Germany Agency for Technical Cooperation GTZ IPM-Horticulture Project for Eastern and Southern African Region, the International Institute for Tropical Agriculture (IITA), as well as global programs such as the Integrated Pest Management-Collaborative Research Support Project (IPM CRSP), the Consortium for International Crop Protection (CICP), Natural Resources Institute (NRI), the Rodale Institute, and others. Organizations like the IPM-CRSP, GTZ-Horticulture Project for Eastern and Southern Africa ,and others have vast experience of IPM in Africa. Their databases would be a valuable source of information that can be adapted to complement local databases in situations where there is evident knowledge gaps in the local sources of IPM information.

Considerations for Electronic Connectivity

Zambia has an open policy with respect to internet access. The country currently has two service providers; ZAMNET and ZAMTEL based in Lusaka. Another service provider ZAMCOM is currently being set up. This competition is expected to drive down prices and improve access time. A number of institutions expected to be part of the IPM/sustainable agriculture network already have access to the internet and e-mail services.

Current infrastructure in terms of computers, electricity, and telephone lines are to an extent capable of supporting the network's computer-mediated communication, in addition to other forms of communication especially radio and television. Because of the dependence of computer-mediated communication on telephone lines, this facility may require expansion among some networking partners. Single lines often already support a telephone and or fax. Computer access may also be limiting in some institutions. It would be possible to create an IPM information hub at Mount Makulu Central Research Station, with a satellite dish access to ZAMNET for around $6, 000. This would provide a fast service independent of old telephone lines.

Regional and global support and expertise would be necessary in setting up the national IPM collaborative network. Coordination would be paramount to the success of the network. Financial support would be required to cover the costs of connection in addition to the purchase of various accessories for internet connection. Support will also be required in the transformation of IPM databases in print form to electronic form. Network facilitators will need to be trained.

To ensure the sustainability of such an initiative, it will be necessary to have a participatory approach in the planning and implementation phase. Policy makers, resource managers, and members of the general public will need to be sensitized on the importance of IPM to sustainable national agricultural development.

Conclusion

The experience from Zambia shows the potential of IPM in offering sustainable solutions to major pest problems. However, there are still many pest-related problems facing the farmer. To deal with these, collaboration among IPM practitioners supported by an effective communication system would help in the promotion of IPM.

As a first step, a national forum of IPM practitioners, policy makers, and other stake-holders is a prerequisite for the successful establishment of the IPM network in Zambia. Resources have to be sought for this initiative.

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The IPM CRSP and IPM-Relevant Networking Initiatives in Africa.

Brhane Gebrekidan and Jean-Pierre Amirault,
IPM CRSP/Africa IPM Link,
OIRD, Virginia Tech

The IPM CRSP is a USAID-supported research, education/training, and information exchange collaborative partnership among United States and developing country institutions. It focuses on participatory and collaborative IPM research and education programs for horticultural export crops and other food production systems in a global context. IPM has been applied by the CRSP in highly proactive and participatory way to foster development and adoption of IPM practices in strategically selected regions.

The two African countries where the IPM CRSP has major programs are Mali and Uganda. The IPM CRSP programs in these two countries deal with high priority crops and their key pests as identified through a participatory appraisal. The IPM CRSP deals with insects, diseases, weeds, and their related socioeconomic and policy issues. The constraints addressed by the CRSP in general cover technical, social, economic, institutional, and policy issues.

IPM information generation and dissemination is one of the major activities of the CRSP and it accomplishes this in various ways. Among these are:

- Peer reviewed articles – published in different refereed journals
- Workshop Proceedings – published by the CRSP and covering progress in IPM CRSP research comprehensively
- Theses – produced by graduate students supported by the CRSP
- Fact Sheets – produced for specific crops and pests in selected sites where the CRSP is working
- Newsletter – an IPM CRSP Update newsletter is published quarterly
- Annual Reports – the CRSP publishes a comprehensive annual report which is distributed to all collaborators and partners
- Videos – the CRSP documents selected activities in some of its sites in the form of videos
- Internet – the IPM CRSP has a comprehensive web site (http://www.cals.vt.edu/ipm crsp/index.html) which gives information on the major activities of the CRSP.

The IPM CRSP is one of the several networking initiatives in Africa listed below.

Brief Overview of Selected IPM-Relevant

Networking Initiatives in Africa

GLOBAL and PAN-AFRICAN INITIATIVES

Network	Emphasis / Countries	Contact Information
IPM CRSP (IPM Collaborative Research Support Program)	Participatory, collaborative research, and capacity building. ● Mali: sorghum, millet, cowpeas ● Uganda: cereals and legumes ● Eritrea: IPM training	Brhane Gebrekidan Program Director Office of International Research and Development, Virginia Tech 1060 Litton Reaves Hall Blacksburg, VA, USA 24061-0334 Tel: 540-231-3513 Fax: 540-231-3519 e-mail: brhane@vt.edu http://www.cals.vt.edu/ipmcrsp/index.html
CICP (Consortium for International Crop Protection)	Promote WWW-based IPM information	George A. Schaefers Executive Director NY State Agr. Experimental Station Geneva, NY, USA, 14456 Tel: 315-787-2346 Fax: 315-787-2418 e-mail: gas1@NYSAES.cornell.edu http://www.ipmnet.org/
IPM Forum	Strengthening the capacity of NGOs to promote and implement appropriate IPM approaches and techniques	Malcolm Iles NRI Chatham Maritime, Kent, U.K. ME4 4TB Tel: 44 (0) 1634 883054/3063 Fax: 44 (0) 134 883377 e-mail: malcolm.iles@nri.org http://www.nri.org/IPMForum/index.htm
Global IPM Facility (sponsored by FAO/ UNDP/ UNEP/ World Bank/ Government of Norway/ Swiss Agency for Development and Cooperation)	IPM farmer field schools (FFS)	Peter E. Kenmore Food and Agriculture Organization of the United Nations (FAO) AGP, Room B752 Viale delle Terme di Caracalla 00100 Rome, Italy Tel: (39-06) 5705-2188, email: peter.kenmore@fao.org
SP-IPM (System-Wide Program for IPM) CGIAR IPM Network	Strengthen inter-Center collaboration, enhance communication between IARCs and partners, and support IPM implementation through research and training.	Richard Markham IITA - Ibadan Oyo Road, PMB 5320, Ibadan, Nigeria Tel: (234-2) 241-2626 Fax: (234-2) 241-2221 e-mail: ipm-center@cgnet.com http://www.cgiar.org/spipm/

ORSTOM* ***(Institut français de recherche scientifique pour le développement en coopération)***	Agricultural research and cooperation in tropical and sub-tropical countries. Strong presence in West and Central Africa.	209, rue La Fayette, 75480 Paris CEDEX 10 France Tel : (33) 1 48 03 77 77 Fax : (33) 1 48 03 08 29 http://www.orstom.fr/welcome_ang.html
(now IRD - Institut de recherche pour le développement)		
CIRAD ***(Centre de coopération internationale en recherche agronomique pour le développement)***	Agricultural research and training in tropical and sub-tropical countries. Strong presence in West and Central Africa.	42, rue Scheffer 75116 Paris France Tel : 01 53 70 20 00 Fax: 01 47 55 15 30 http://www.cirad.fr/

Regional Initiatives

Network	Emphasis / Countries	Contact Information
ASARECA (Association for Strengthening Agricultural Research in Eastern and Central Africa)		Geoffrey Mrema Executive Secretary P.O. Box 765 Entebbe, Uganda Tel: 256-42 20212 or 20556 Fax: 256-42 21126 or 21070 e-mail: mreme@asareca.cp.starcom.co.ug
• **AFRENA-ECA (Agroforestry Research Network in Africa - Eastern and Central Africa)**	Agroforestry research in the Eastern Africa Highlands	backstopped by ICRAF
• **EARRNET (Eastern Africa Rootcrops Research Network)**	research on cassava	backstopped by IITA
• **ECABREN (Eastern and Central Africa Bean Research Network)**	bean research	backstopped by CIAT
• **PRAPACE (Regional Potato and Sweet Potato Improvement Programme in Eastern and Central Africa)**	research on sweet and Irish potatoes	backstopped by CIP
• **BARNESA (Banana Reseach Network for Eastern and Southem Africa)**	Covers also Southern countries such as Malawi, South Africa and Mauritius.	backstopped by INIBAP/IPGRI

• **ECAMWRN (Eastern and Central Africa Maize and Wheat Research Network)**	Includes five regional projects: • EACP, East Africa Cereals Project; • Development of Stess Tolerant Maize; • Highland Maize Project; • Socio-Economics; • Wheat Breeding and Pathology projects.	backstopped by CIMMYT
• **ECSARRN (Eastern, Central and Southern Africa Rice Research Network**		backstopped by IRRI & WARDA
• **ECARSAM (Eastern and Central Africa Regional Sorghum and Millet Research Network)**		backstopped by ICRISAT/INTSORMIL
Africa IPM Link **(in collaboration with CICP and USAID's AfricaLink)**	• Promote the adoption and use of electronic communication and networking for information exchange in sub-Saharan Africa • Initial focus in Senegal, Mali, Ghana, Uganda, Ethiopia, Kenya, and Zimbabwe.	Jean-Pierre Amirault Assistant Coordinator Office of International Research And Development, Virginia Tech 1060 Litton Reaves Hall Blacksburg, VA, USA 24061-0334 Tel: 540-231-4315 Fax: 540-231-3519 e-mail: amirault@vt.edu http://www.cals.vt.edu/ail/index.html
PAN-Africa (Pesticide Action Network Regional Center for Africa)	• Pesticide awareness, addressing needs of NGOs • support for organic cotton production	Abou Thiam Regional Coordinator for Africa Pesticide Action Network (PAN) B.P. 15938 Dakar - Fann, Sénégal Tel: 221-25-49-14 Fax: 221-25-49-14 e-mail: panafric@sonatel.senet.net
WARDA (West Africa Rice Development Association)	Conduct rice research, training, and communications activities for the benefit of the West African region.	WARDA 01 B.P. 2551 Bouake 01, Cote d'Ivoire Tel: (225) 634514 Fax: (225) 634714 E-mail: WARDA@cgnet.com http://www.cgiar.org/warda/index.htm
PASCON (Pan African *Striga* Control Network)	Provide a coordinated system for mutual collaboration and cooperation among various National Programs, and between them and International and Regional Agricultural Institutions.	S.T.O. Lagoke Coordinator Dept of Agronomy Ahamadu Bello University Zaria Nigeria Tel: 234 069 51840 Fax 234 069 51355, 069 50563 e-mail stlagoke@abu.edu.ng

SAFRINET (the Southern African "LOOP" of BioNET-International)	SAFRINET is a technical co-operation network between countries of the Southern African Development Community (SADC) to promote and sustain realistic self-reliance in biosystematic services, particularly for invertebrates and other micro-organisms.	Connal Eardley Coordinator Biosystematics Division Plant Protection Research Institute Private Bag X134, Pretoria South Africa Tel: 2 012 323 8540 Fax 2 012 325 6998 e-mail: vrehcde@plant5.agric.za
E/S African Stem Borer Network	Stemborer research network for Eastern and Southern Africa based at ICIPE.	William A. Overholt Coordinator ICIPE P.O. Box 30772 Nairobi, Kenya Tel: 254-2-802072 Fax: 254-2-803360 e-mail: billo@tt.sasa.unep.no
E/S African Regional Vegetable IPM Project (GTZ)	• Support research activities directed at economically important pests of brassicas, citrus, French beans and tomatoes. • Project operates in Kenya, Malawi, Mozambique, Tanzania, Uganda, Zambia and Zimbabwe.	A. A. Seif GTZ-IPM Horticulture Project Lenana Road P.O. Box 41607 Nairobi, Kenya Tel: 254-2-803185 / 803485 Fax: 254-2-562670/1 e-mail: gtzipm@arcc.or.ke
ROCAFREMI (Réseau ouest et centrafricain de recherche sur le mil)	Millet research	Botorou Ouendeba ICRISAT Sahelian Center BP 12404, Niamey, Niger Tel (227) 722529, 722626 Fax (227) 734329 e-mail: b.ouendeba@cgnet.com
AGRHYMET Regional Center	• Information collection and dissemination • Training active in CILSS* countries.	B.P. 11011 Niamey, Niger Tel : (227) 73.31.16 / 73.24.36 Fax : (227) 73.24.35 E-mail : admin@sahel.agrhymet.ne http://WWW.agrhymet.ne/
INSAH (Institut du Sahel) Protection des végétaux	Coordination, promotion, and harmonization of IPM research and information dissemination in the CILSS* countries	B.P 1530 Bamako, Mali Tel: (223) 234067 Fax: (223) 222337 E-mail: touba@padres.insah.ml

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Current (non-networked) IPM Information Resources, Constraints, and Needs

George A. Schaefers
Executive Director
CICP

Much of the information presented here was obtained from various sources including background visits to 10 east and southern Africa countries in 1997, an earlier (1989) study by Van Der Weel and Van Huis at Wageningen (IPM in The Tropics, Needs and Constraints of Information and Documentation), the Catalogue of Training and Extension Materials for IPM by F. A. N. van Alebeek, 1989), and pages on the World Wide Web.

As emphasized elsewhere in the workshop, IPM is an information dependent, crop protection strategy. It thus becomes critical to our objective, i.e. to optimize the circulation of IPM information in Africa, that we examine current resources and assess constraints and needs. The present paper is not a comprehensive review of the subject but is intended as a background resource and a basis for continued discussion. Workshop participants are encouraged to review their role in assessing and/or disseminating crop protection information, identify and evaluate the utility of their resources, discuss their limitations, and consider options for their improvement. IPM is considered here in the broadest of senses, in that any information relating to crop protection, including forestry even if somewhat distantly related is included.

For clarity of discussion it is appropriate to not only classify the information-users but the characteristics of the information itself. In every instance it is understood that the ultimate information user and the number one priority of the "providers" will be the agricultural producer or farmer, i.e. the one who uses the information to enhance production directly. This would include traditional and emergent as well as cash/export growers. In contrast, the scientific arena, or secondary target of information brokers, uses information received from all other sources to enhance research efficiency and thus indirectly facilitate agricultural production. In a similar relationship, other groups serve as information collators (managers or brokers), use it to develop agricultural policy, or act as intermediates in the distribution of available information, again for the ultimate benefit of the farmer. Unfortunately, it is the intermediates, such as extension service, NGOs, and the private sector including the Agro-industry groups who deal directly with farmers, who have the greatest difficulties obtaining information and remain the core recipients of information from information brokers. Each group is a major player in the circulation of information and in so doing are simultaneously both users and producers of the information.

Information has been classified in many different ways depending on the planned utility of the information. For our purposes informational resources need only be classified according to the needs of the basic information producer, the research scientist, or the ultimate user the farmer. That is either as technical information, or locally adapted non-technical information, either of which may be published in recognized journals or monographs or other releases including the less accessible "grey" literature.

Non-Networked IPM Informational Resources

Personal Contacts:

Examples:

Neighbors (farmers)-Farmers experiences are very valuable and useful
Scientific colleagues (Research Scientists)
Institutional collaborations and partnerships.

Comments: Usually a one-on-one exchange, slow and inefficient except among technical experts. There also exists the question of credibility and inaccurate transmission.

Scientific Journals:

Examples:

Many
Insect Science and its application: the international journal of tropical insect science. ICIPE

Target:

Research Scientists
Less productive for intermediates

Comments:

Slow to search, often not productive
Not locally related
Expensive
Many African journals have struggled with limited and uncertain funding, published irregularly or infrequently, and many have faded out of existence.

There exists a shift towards electronic publication of scientific journals. This is presenting both challenges and opportunities for scientific organizations. The transition is inevitable but the impact on revenues remains a major issue.

Non-conventional, Grey, Renegade Literature:

Examples:

Include non-"published" documents, progress reports, annual reports,special reports, etc.

Comments:

Difficult to come by except on a regional or local basis.
As with periodicals, such literature must be electronically formatted and made available on institutional homepages, CD ROMs, or electronic tapes with appropriate keyword indexing.

Fact sheets and bulletins:

Examples:

A multitude of pamphlets and specialty publications.

FAO Plant Protection Bulletin. FAO Quarterly.
See-Catalogue on IPM training and extension resources in the tropics.

Target:

Intermediates and farmers.

Comments:

Non-technical documents of use to extension agents etc.

Bibliographic Searches:

Name	Titles	Printed	CD-ROM	On-line	Document Services
BIOSIS	13 Mill.	$8,360.a/	$13,075.b/	$1./minute+$1.45/record	Full Text Available c/
CABI-II	3 Mill. d/	Available	$3,200/Volume e/ Member Country	$15,000/yrf/	$14 Post/article g/

AGRICOLA	3.4 Mill.	NA	$1,675 1970-present Stand alone h/	Available	$5.00/10 pages $3/each addition
AGRIS-FAO	2.0 Mill.	AGRINDEX I/	$1,375. 1975-1990	Available	Available

a/ Biological Abstracts, cumulative index $3,310.
b/ Silverplatter price. One time purchase product
c/ BIOSIS document express, "a fast, cost effective means of acquiring full-text copies"
d/ 1973 to present, plus similar number in printed form pre-1973.
e/ current volumes. Earlier volumes $1,840-8,800/volume-Member Co's
f/ Pay as you use contact http://www.sivrplatter.com/.
g/ FAX $33 US
h/ 1984 to present-standalone $825.00
i/ Monthly bibliography

NOTES:

BIOSIS:
Scope, biological literature (journals, books, monographs, and conf. proceedings) including crop protection.

Unique access to "fugitive or non-conventional documents" which contain valued references.

CABI-II-CAB INTERNATIONAL Information Institute

- Compilation of bibliographic databases-**CAB ABSTRACTS**
- Covers all aspects of agriculture including Crop Protection, Production and Forestry.
- Does not cover extension literature. However regularly scans over 600
- African serials and attempts to incorporate gray literature.

Search Service:

Costs:

Less than 50 refs.	62.5 Brit. Pd.
51-100	75.0
501-100	300.00.0

AGRICOLA- a CD-ROM version of the Bibliography of Agriculture compiled by the U.S. National Agricultural Library (NAL)

- Including crop management, entomology, pesticides, etc.
- Indexes articles, books, theses etc.
- More extension-type literature than CAB.
- Search Service-Threshold level for free information support services is one hour of staff time, or $25.00 in computer usage costs.

AGRIS-FAO For Agricultural sciences and Technology including plant and animal protection. Includes bibliographic references either conventional (journal articles, books) and non-conventional or grey literature (theses, reports, etc.) not available through normal channels.

- Cooperative system in which participating countries input references and in return draw on information provided by others.
- Currently in English, French and Spanish.

CD-ROM-4-disc set 1975-1990 through silver platter. Along with 1991 updated quarterly until full.

Cost:

One-time subscription	$1,375.00 1975-90
Regular Subscription	2,035.00 1975+
Regular subscription	825.00 1991+

Search Services-Retrospective searches available.

Selective dissemination of information

Others:

PHYTOMED (mainly phytomedicine)
AGRALIN (Contents of Netherlands Libraries)
ATA (Abstracts of Tropical Agriculture)
Current Contents
CTA
FAO

COMMENTS:

Searches usually initiated by scientists. The materials are usually more scientifically abstract and less practical or "extension-like"

Constraints:

- Retrieval efficiency: Costs of abstracts are high and all do not provide abstracts. Many useful references not retrievable because keywords not included in titles. "Virtually impossible to separate all IPM related references from the databases" CAB emphasizes research thus not useful for extension type information. Others somewhat similar. Not worth search for non-conventional literature.
- Retrieval from electronic databases. IPM keywords not incorporated. Important to give more attention to keywords. "One can conclude that international databases specialized in dissemination of agricultural information and documentation, are not able to produce adequate information on IPM on a practical level, readily useable in rural situations in the tropics." It is virtually impossible to retrieve all the IPM information from the databases without obtaining to much "noise" and without leaving out important references.
- Paucity of location-specific information concerning African crop protection and research.

Libraries:

Examples:

- CICP-IPPC Ray F.Smith IPM Library, Oregon State University

  A major source of IPM information that is currently being catalogued into the US Library of Congress (LOC) system. A plan has been developed to catalog the extensive "grey" literature.
- KARI-attempting to develop a library information service in order to centralize information resources for about 30 KARI sites.
- IITA Library, Ibadan, Nigeria
- National Libraries; Namibia, Botswana, etc.
- Cornell University-Mann Library of Agriculture. Recognized as most extensive collection in world.

  Have initiated a program to place extensive collection of Journals and Monographs onto 60 CD ROMs for use in 111 developing countries. Only Journals initially. Have contracted for the CABI keyword index. Anticipate that the 60 disk collection will cost about $10,000 with $5000 for annual updates.

Comments: Often restricted use and passive in nature.

Information Resource Centers:

- ARIS-Agricultural Research Information Service-Uganda.
- ERO-Ethiopian Research Organization-crop protection "packages"
- Pivotal role-NGO's (See CARE)

- Usually associated with research institutions.

Electronic Compendia:

Examples:

- CD-ROM for global pest management
- Crop Protection Compendium (CABI) (Comments from Munyua)
- 100's of crop pest data sheets, biological and agricultural data.
- Over 1000 major pests and their enemies, 150 crops, 150 countries
- East African Forest IPM (Comments from Ward and Douce)

Comments: The direction of publication. Words of caution in that CDs are not permanent, i.e. do have an determinate survival period. 50 years compared to acid free buffered paper with a survival period of 100 years. Further, the transitionalnature of software must be considered.

Crop Protection Newsletters:

Examples:

IPMnet NEWS:

Published by Consortium for International Crop Protection (CICP)
Starting 5th year of monthly issues.
Summarizes current IPM news of global interest, recent publications, reports of meetings, calendar of events, etc.

Format: E-Mail to over 1300 addresses in 97 countries (18 in Africa)On-line via IPMnet http://www.IPMnet.org

Costs: Free of charge

IPM Working for Development:

Produced tri-annually by the Secretariat for the IPM Forum.
Aims to reach and promote information exchange amongst a wide audience and range of contributors. Non-technical format.
Produced in four languages.

Formats:
Printed form.
On-line via IPMEurope Web Pages. http://www.nri.orgIPMEurope/homepage.html
Costs: Free of Charge

Forestry Pest Management:

A newsletter for Eastern and Southern Africa
Produced with financial assistance from USDA, CIDA and IFID

Format: Printed Copy.
Cost: Free of charge

NAPREECA Newsletter

Natural products research network for eastern and central Africa.

InfoLetter-IPPC Oregon State University

ILEIA-Information Centre for Low External Input Agriculture, P.O. Box 64, 3830 AB Leusden, Netherlands
PAN Newsletter

The IPM Practitioner

GTZ IPM Newsletter: Published in Malawi.

NOTES: Re: van der Weel and Van Huis, 1989

Constraints to IPM development and implementation

1. Major constraint-Information is unavailable, i.e. either non-existent or inaccessible, but clearly the latter situation predominates.
   a. Greater constraint for farmers, extension, etc. than for research, who have their own channels.

2. Reasons:
   a. National documentation services poorly equipped, lack funds and organization.
   b. Specific IPM information difficult and costly to obtain.
      Non-conventional information (site of much good IPM information) generally not retrievable.
   c. Includes: annual and periodic reports, unpublished research materials, irregular serials, bulletins, pamphlets, etc.
   d. Information flow inhibited by non-functional extension services.
   e. Unreliable telecommunications
   f. Lack of library and information standards
   g. Insufficient hard-copy collections
   h. Insufficient hard-copy collections
   i. Low informal information flow
   j. Little attention to level of knowledge, perception and culture of small farmers

3. Recommendation: Develop an IPM information Network to link all levels of knowledge (i.e. a very diverse and dispersed group dealing with different levels of knowledge transfer) and establish a multi-directional flow of information.
   a. Targets: Farmer #1, via intermediaries (extension, projects, farmers organizations and cooperatives, NGO's, etc.) May be necessary to "repackage" information for non-technical users (administrators, policy makers, extension workers, and other intermediaries.) Research scientists: Modern scientific research relies heavily on the ability to communicate. In many situations in Africa, scientists lack contacts and a budget for information and documentation.
   b. Functions: information exchange at all levels, provide contacts, literature searches including non-conventional ad scientific, document delivery, question/answer services, newsletters, publications.
   c. Costs, free or nominal

ANNEX 1-CONTACTS

BIOSIS-On-Line-called BIOSIS Previews Biol. Abstracts +RRM (Reports, reviews, meetings).

Venders:

DIALOG-http://dialog.krinfo.com
Datastar-http://dsweb.krinfo.ch
OVID-http://www.ovi.com
STN-http://stneasy.cas.org
DIMDI-http://www.dimdi.de/homeeg.tm
Contacts- FAX: 215 587 2016 (Worldwide)
FAX: +44(0)1904 612793 (UK)
Email: Info@mail.biosis.org
http://www.biosis.org

CAB INTERNATIONAL

PO Box 76520
Nairobi, Kenya
Tel: ++254 2 747329 or 747337
FAX: ++254 2 747340
E-Mail: cabi-roaf@cabi.org

AGRICOLA is the CD-ROM version.

Contact: E-Mail: infor@silverplatter.com
Or
National Agricultural Library
Indexing Branch, Rom 011
10301 Baltimore Ave.
Beltsville, MD, 10705-2351
http://www.nalusda.gov/indexing/subjguid.html

ON-Line Access:

DIALOG- contact@dialog.com
EUROPEAN, MIDDLE EAST, AFRICA (EMEA) Headquarters,

The Communications Building, 48 Leicester Square,
LONDON, WC2H 7DB, UK
Tel: (44) 171 930 6900 Fax: (44) 171 930 6006

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Magnetic Tapes: NTIS

National Technical Information Service
Technology Administration
U.S. Department of Commerce
Springfield,Va. 22161
Tel: 703 605 6000
Fax: 703 321 8547

Free delivery service via AGLINET libraries

USDA, National Agricultural library
Document Delivery Services Branch, Rom 300
10301 Baltimore Ave., NAL Bldg.
Beltsville, MD. 20705-2351

For service cost information contact:

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Reference Section, Room 100
National Agricultral library
Beltsville, MD 20705-2351
Tel (301) 504 5204

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W4 4PH England.

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Proceedings of the
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International Centre for Insect Physiology and Ecology (ICIPE)

Updating the Catalogue on Integrated Pest Management

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Background

In 1989, the Department of Entomology of Wageningen Agricultural University and the Technical Centre for Agricultural and Rural Cooperation (CTA) published the book, *Integrated Pest Management. A Catalogue of Training and Extension Materials for Projects in (Sub)tropical Regions*. This catalogue provides detailed descriptions of more than 400 handbooks, field manuals and pocket guides, international journals, and over 200 slide sets, posters, films and videos, all concerning IPM in (sub)tropical crops. Each item provides information on its contents, publisher, and ordering details. In addition, the catalogue contains a worldwide directory of more than 150 IPM research and information centres. Five indices (e.g. on crop and geographical region) provide easy entrances to the information in the catalogue.

The catalogue is aimed at field workers and staff of research institutes, plant protection services, agricultural extension organizations, plant production and protection departments of agricultural education institutes, and all those involved in crop protection in tropical and subtropical regions. Five thousand copies of the book have been distributed to over 1,200 institutes, NGO's, and individuals worldwide and has met with great enthousiasm.

A New Update of the Catalogue

The book has been out of print for two years, and some of the information and addresses in the catalogue are outdated. Important new materials have become available since its publication in 1989, and new approaches in IPM extension, especially those which actively involve farmers in IPM extension (participatory extension), should be included. The Department of Entomology (WAU) is currently formulating a project with the following objectives:

- to produce a computerized database version of the 1989 Catalogue. This will allow the user to search information much more quickly and flexibly by means of keywords.
- to update, revise, and expand the information in the database. New materials produced during the last 10 years and new organizations will be added. The database will be extended with key scientific articles on IPM and the process of IPM implementation, lists of projects and case studies of successful IPM projects, and IPM-related links on the Internet.
- To distribute the electronic database with an application programme on diskettes, via e-mail and the Internet to interested users. The production of a printed version is still an option that can be produced relatively easily.

  To establish a homebase for the maintenance of the data©base at the CILLS Crop Protection Training Department (DFPV) in Niger. The database will be kept up-to-date by entering new information that becomes available. Institutions and users of the database will have the possibility of submitting new materials via e-mail and the Internet.

Call for information

With the aim to improve the intended contents of the new Catalogue, we are distributing a questionnaire to institutions and individuals who have used the 1989 Catalogue or otherwise qualify as a target audience for the new Catalogue. The objectives of this inventory are:

- to analyze users' experiences with the 1989 Catalogue,
- to identify the present needs for IPM information, and
  to contact potential users of the database that can provide relevant materials for the revision of the database (e.g. IPM training and extension publications, addresses, project descriptions and case studies).

Any suggestions for organizations, addresses, relevant extension materials, and publications lists are welcome.

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Pan African Striga Control Network

S.T.O. Lagoke
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PASCON Coordinator

Introduction

Striga species and related parasitic weeds of the Scrophulariacae family are the most important biotic constraints to food crop production in sub-Saharan Africa (FAO, 1989) causing severe and moderate damage in 21 and 22 countries respectively (Emechebe, 1991). While it was previously estimated that about two-thirds of the 73 million hectares devoted to cereal production are situated in ecological zones where *striga* is endemic, recent surveys have shown wider distribution to areas of high rainfall (Lagoke *et al.,* 1994).

Some of the facts responsible for the incidence, intensity, and spread of *Striga* included successive cultivation of susceptible crop types; the wide host range among cultivated and non-cultivated plants such as wild grasses and legumes; ease of dissemination of the light minuscule *striga* seeds by wind, water, and human activities including the use of farm machinery, animal wastes, and contaminated crop seeds; degrading soil conditions in favor of the parasite; wide genetic variability; and inadequate control of emerged *striga* plants, thus resulting in increased production of viable seeds. Ironically, various efforts made by governments to increase food crop production and security have increased the incidence, intensity, and spread of *Striga*. *Striga* can easily spread to unaffected areas if adequate control measures are not taken in time.

Crop Losses

Striga derives minerals nutrients, water, carbo-hydrates, and amino-acids by parasitizing the host crops through root connections. These hots include the major staple food crops, which are cereals (maize, sorghum, millet, rice, fonio, teff, hungry rice, and more recently wheat), grain legumes and oil seeds (cowpea, soyabean, groundnut, bambarranut, broadbean, frenchbean, dolichos, green gram, black gram, and sesame), and horticultural crops (tomato and potato), as well as industrial crops, sugar cane and tobacco.

These parasitic weeds have been reported to cause estimated yield losses of 10 to 95 percent, depending on varietal reaction, ecology, and agronomic practices. In 1986, crop losses in sub-Saharan Africa due to *Striga* were estimated at an 40 percent, equivalent to seven billion US dollars worth of cereals annually. In some areas, parasitism by *Striga* causes complete crop failure, and farmers are forced to abandon heavily infested fields in search of *Striga* free ones. The resource-poor farmers, who constitute 80 percent of the farming population, are the most threatened by this most important biotic constraint. The greatest damage occurs in the savanna and sahelian zones, which constitute the major areas of food grain production in the region. In addition, these areas are also severely affected by other constraints, both physical (drought, low and erratic rainfall, degrading soil conditions) and biotic (other pests and diseases).

Out of the 24 *Striga* species identified in Africa, 10 constitute an immediate threat to crop production, as well as several species of other genera of the *Scrophulariaceae* family, i.e. *Alectra, Buchnera,* and *Ramphicarpa.* The economically most important parasitic weed species in Africa are *Striga hermonthica, S. asiatica, S. aspera, S. forbesii, S. gesnerioides* and *Alectra vogelii* (Table 1). Between four and 11 parasitic weed species are found in each country stretching from Cape Verde on the West coast, through West, Central, East, and Southern Africa (Lagoke, 1989).

Control Methods and Limitations

Experimental work on control methods for *striga* commenced in Africa in 1905, when the problem was recognized. Although the previous research efforts yielded some results, they did not produce an effective and appropriate solution to the *striga* problem at the farmer's level in the region. The failure to develop an appropriate solution may be attributed to the complexity of the problem, the nature and approach of past research efforts, and the available resources.

Striga has highly specialized relationships with the hosts and exhibits wide genetic variability, resulting in different physiological strain, sub-species, ecotypes, and morphotypes. It also has a wide range of prolificity, longevity, and dormancy of seeds, and some species are able to undergo intra-specific and inter-specific hybridization. This has resulted in a wide adaptation to environments and hosts, as well as different levels of virulence, thus making *striga* a very serious but peculiar constraint in terms of difficulties encountered in its control. The *striga* problem is so complex that some strategic and applied research is still required before effective control measures can be integrated.

Previous research efforts were confined to the development of *single* components for *striga* control, usually based on the researcher's perception and discipline, rather than integrated on a multidisciplinary approach. Such approaches rarely considered the farmer's reality, the complexity of the developed were so "watertight" that any slight modification in the agro-system causes the breakdown in their performance. Many control components could not fit within the farming practices and the expected socio-economic benefits could not be derived from them. Consequently, there was the problem of non-adoption by the farmers.

No one country or research organization has the resources to develop and test *Striga* control technologies, that can be applied across the continent in the production of a wide range of crops. The National Agricultural Research and Extension System (NARES) lacks the funds and do not have enough sufficiently trained manpower to adequately test control technologies and to develop integrated *Striga* control technology. The resources of the extension and crop protection services to visit, monitor and train are too limited, which seriously hampers the transfer and implementation for available technologies to the farmers. The majority of the farmers, in addition, may not be able to adopt, or correctly use, available technologies, either because the funds, manpower or supplementary inputs are lacking, or because the farm household has set different priorities. Policy makers therefore need to promote the availability of required inputs to the majority of farmers, and the development of an appropriate marking system for affected food crops.

The Role of Pascon

Genesis

Various meetings were held, in Africa in particular, to draw the attention of governments, scientists, organizations, and the international community, to *Striga* as the limiting biotic factor to food crop production in the region. The joint FA/OAU All-Africa Government Consultation on *Striga*, held in Maroua, Cameroon, in October 1986, was the first effective attempt to provide an inventory of knowledge, activities, and findings of individual institutions and nations, and an assessment of their effectiveness to provide a solution to the *Striga* problem. The unequivocal conclusion, of several international workshops on *Striga* was that the various efforts were being pursued largely in isolation, with little exchange of information, and without the benefit of a coordinating framework.

Given the Pan-African nature and seriousness of the *Striga* problem the need for a concerted, coordinated Regional Program was evident. It was the recognition of this critical deficiency that lead to the creation of the Pan-African *Striga* Control Network (PASCON), in Banjul, The Gambia, in December 1998. The objective and structuring governing entities and research agenda were considered in detail at the first PASCON Workshop in Ibadan, March 1990.

Objective and Organization

The purpose of PASCON is to provide a coordinated system for mutual collaboration and cooperation among various National Programs, on one hand, and between them and International and Regional Agricultural Institutions, on the other in *Striga* activities, especially the control of *Striga*.

The specific objectives of the network are:

- to promote collaborative research on control methods of *Striga* and their application,
- to strengthen the capabilities of NARES in the areas of *Striga* research and control,
- to facilitate exchange and dissemination of information on *Striga* research and control among participating institutions within and outside the region, and
- to promote the development, adoption and implementation of Integrated *Striga* Management Technology at the farmers' level.

Membership of PASCON

Membership of PASCON is open to:

- NARES, involved in all levels of *Striga* research, control, and extension in sub-Saharan Africa countries;
- International Agricultural Research Centres (IARCs) and advanced laboratories involved in strategic research on, and in control of *Striga*; and

- Regional Research Coordination Agencies (RRCAs) associated with *Striga* research or with the network.

NARES Participation

The number of NARES participating in PASCON has increased from two to 27 consisting of Benin, Burkina Faso, Burundi, Cameroon, Chad, Congo DR, Ethiopia, Gambia, Ghana, Guinea, Ivory Coast, Kenya, Madagascar, Mali, Niger, Nigeria, Rwanda, Senegal, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, and Zimbabwe.

All participating institutions and agencies will meet every two years at the General Workshop. The General Workshop will review and assess on-going *Striga* activities, identify research needs and priorities, and promote the exchange of technical information research methodologies and experiences.

The steering committee will be the driving force of the network. It comprises active scientists of participating NARES, IARCs, RRCAs, and advanced laboratories, elected at the General Workshop.

Activities

The major activities of PASCON are in consonance with the knowledge process and corresponding activities involved in the implementation of effective IPM programs (NRI, 1991). They include the promotion and coordination of:

- interaction and sharing of experience;
- strategic and applied research and surveys to identify the levels of infestation. crops affected, feasibility of control activities, and perception of armers to relate the *Striga* problem to the farming system, and to identify existing control methods and their effectiveness, as well as the generation and evaluation of control components;
- the development of integrated *Striga* management technologies (ISMT) for on-station and on-farm testing;
- on-farm demonstration, adaptation of ISMT; and
- the extension of proven ISMT.

These also include information dissemination and exchange through the newsletter proceedings, reports of meetings, inventories and workshops, and the strengthening of NARES through the training of scientists and provision of, or mediation for resources where necessary. In spite of the limited funds, currently borne by FAO, PASCON has successfully undertaken some of these activities.

General Workshop

Since the establishment of the network four workshops have been held, the first at IITA, Ibadan, March 1990, the second in Nairobi, June 1991, the third in Harare, October 1993, and the fourth in Bamako, October 1996.

The first General Workshop reviewed the activities of the network, exchanged experiences, facilitated interactions among scientists, and planned future activities on *Striga*. The workshop also discussed research methodologies, constraints and results, and expressed the need to standardize research protocols and survey methodologies on the *Striga* problem and control feasibility. It was decided that appropriate ISMT be developed for the different ecologies, level of infestation, and farming systems. It was recognized that on-farm research was essential and appropriate to National Plant Protection Research Institutions.

The need for basic research was also emphasized and found appropriate to International Centers, and the long-term and short-term research priorities were identified. Much emphasis was placed on the need for on-farm of ISMT based on existing research information on available components (short term), and on those developed by national programs (long term).

The second General Workshop was attended by 89 participants representing 16 National Programmes IARCs (CIMMYT, ICRISAT, IITA and IRAT)

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Proceedings of the Integrated Pest Management Communications Workshop: Eastern/Southern Africa

March 1-6, 1998, Nairobi, Kenya

International Centre for Insect Physiology and Ecology (ICIPE)

NGO Action Group for IPM

M. Mihowa, Malawi and Dr. M. Iles
IPMForum

(As transcribed by G.A. Schaefers)

Mrs. L. Mihowa is the NGO-IPM Network Coordinator in East and Southern Africa of which The Coordination Unit for Rehabilitation and Environment (CURE) is a member. Mrs. Mihowa provided a brief overview of the activities of the NGO community network while Dr. Iles reflected a broader perspective from the viewpoint of the IPMForum.

Malawi has an agro-based economy thus any issues of sustainability rate a high level of attention. Because the Government has adopted new high-priority programs, issues of sustainability have fallen to the NGO community. Subsequent to the IPM Workshops sponsored by the IPMForum, visits were made to various Malawian IPM stakeholders, including Government Departments and NGOs. It was clear that most of the NGOs were moving towards sustainable agriculture. In the l960s, the GOM removed subsidies, and increased costs were the responsibility of the farmer. These and other constraints to increased productivity turned the farmers toward the NGO community for assistance in IPM.

Basically, the NGO IPM Network in Malawi focuses on developing good communication among themselves in an attempt to provide a forum for information exchange and sharing of technical know-how including experiences.

As to the structure of the IPM network in Malawi, there is presently in place an Executive Committee. The network is headed by an Implementing NGO known as the Teachers Service Committee. The Secretariat of the Network is housed under CURE, a sort of umbrella body for all the Malawi NGOs.

The Network holds quarterly meetings that call upon both national and international NGOs working in Malawi. It works with various government officials who are associate members of the Network. A major activity is developing IPM components. CURE, as the Secretariat, and also because of its role with the Learning and Resource Data, has been able to develop a specific IPM component within the CURE Resource Data. This has been favorably received by other NGOs, CPOs, and government institutions. Among the resources are government documents dealing with IPM and information from the Permaculture Association of Malawi that forwards their quarterly Newsletters, which are published in English as well as National Languages. A CURE Newsletter is also published that usually has items dealing with IPM. The organization also benefits from the GTZ Plant Protection Project in Malawi and receives their Newsletters.

In contrast to other NGOs in Malawi, CURE now has E-Mail capabilities. Thus, when information is received, CURE can make photocopies for other members who can translate into national languages and send them to the appropriate committees. Exchange visits are made to research stations, such as Bunda and other field stations, that are working with communities to combat pest problems on pigeon pea. The Farming System IPM Team at Bunda has looked at various questions of interest to resource poor farmers. For example what is the impact of low income on the introduction of IPM strategies? Useful experiences are being contributed by NGOs during their meetings. The Network committee is currently compiling a profile of the NGOs and the committees that are identifying IPM techniques with the intention of disseminating information.

Mihowa pointed out, however, that there remains a limited flow of information, and she hopes to benefit from the recommendations of this workshop.

Dr. Iles expanded on a couple of points. The workshop that Ms. Mihowa referred to was the result of interactions between a few NGOs and the more formal sector that started out in the IPM implementation workshop that took place in Harare four to five years ago. At the time, the NGOs were very enthusiastic about improving the implementation of IPM. They decided that they wanted to do something, and not just leave it. The

IPMForum Secretariat assisted in the formation of IPM action groups. A postal survey to 200 NGOs resulted in over 100 responses indicating interest in maintaining closer contact with technical expertise. What the IPMForum has been doing in Malawi is trying to be replicated in Kenya, Zimbabwe, Uganda, and Ethiopia. Only little seed money is needed to get started and build links between NGOs interested in strengthening their access to technical expertise and other needs. That kind of agenda has been initiated, but it has been pretty much up to the NGOs to take it and decide what they want, and then we can help out. The concept has taken root and there have been good results, but we don't know if it will continue to move forward.

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Pesticide Action Network (Africa): An NGO Support Center for Sustainable Agriculture in Africa

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What is PAN Africa?

Pesticide Action Network-Africa (PAN) is an information and action network and part of Pesticide Action Network, a global coalition of voluntary groups, NGOs, civil society, research institutes, and citizens. working toward the adoption of sound ecological practices.

Since 1996, the network in Africa is coordinated by a center based in Dakar. The establishment of the center was made possible with the support of USAID Africa Bureau.

Objectives of PAN Africa

Today Pesticide Action Network-Africa has about 150 members in 40 countries. Pan Africa members act together independently in order to:

- inform and sensitize on hazards and problems related to chemical pesticides;
- Work toward the understanding of complex questions and issues related to indiscriminate use of pesticides;
- work toward the consolidation and dissemination of approaches, methods, techniques, and adapted local technologies as alternatives to hazardous chemical pesticides; and
- promote protection of human health and environment based on a sound management and development of local resources.

Main Ongoing Activities

Information sharing is one of the major roles of PAN-Africa because communication is crucial for the network. PAN-Africa is using different tools to ensure better communication among its members and other interested people, institutions, etc.

- publishing the newsletter, *Pesticide & Alternatives* in French and English three times per year;
- coordinating research at the regional level on specific topics done by its members in various countries and preparing and disseminating

reports of these studies (e.g. monitoring of "WHO" pesticide lists 1A and 1B in 7 countries in Africa);

- organizing workshops, training sessions, and conferences on related issues;
- equipping the documentation center with information on pesticides, IPM, sustainable agriculture, organic agriculture, natural crop protection, etc.; and
- setting up a computerized data bank on pesticides, sustainable agriculture, agroecology, etc., which is open to all interested people and institutions.

Specifically related to this workshop, I should mention the proposal we are working on with USAID and Africa Link, Africa IPM Link. The purpose of the project is to help some west African PAN-Africa member NGOs obtain e-mail connectivity (modem, Internet connection, and basic training). Eighteen NGOs from five west African countries (Benin, Burkina Faso, Ghana, Mali, Senegal) are involved in this pilot project.

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African Stemborer Information System: User Needs and Networking Requirements

William Overholt
ICIPE

Background

Cereal stemborers are a major constraint to increasing cereal production in Africa. Yield losses vary but are estimated to be 20-40 percent.

There are several species of stemborers in Africa, often with two or more occurring coincidentally in space and time. Because of their importance to African agriculture, extensive research has been conducted on stemborer taxonomy, ecology, natural enemies, and management methods. However, this information is widely scattered in scientific journals, books, and reports of various university, national, and international agricultural research institutions. Entomologists, working in national extension and research programs, are often unaware of the breadth of information available on stemborers, and even if they were, do not have access to the material due to financial constraints.

In an attempt to increase the availability of information on stemborers to universities, national programs, and NGOs working in pest management in sub-Saharan Africa, ICIPE, with funding from the Dutch Government, is developing an electronic "African stemborer information system." We envisage that the system will consist of several components including pictorial- and text-based keys for identification, a bibliography of relevant literature, ecology of important species, geographic distribution maps, and management options. An information technology specialist has recently been recruited to help develop the system.

The information system would be placed on the Internet for access to users with connectivity, and also be distributed on diskette or CDROM depending on the eventual size. Optimally, the system would also be interactive so that users could help build the system by entering their own information, particularly to help fill in gaps on species distributions and traditional control methods.

Key questions that must be addressed during the development of the information system include:

- Who are the potential users of the information?
- How many of the users currently have access to Internet and how will this number expand in coming years?
- What information is most needed by the potential users? How can it be best packaged?
- Would "downloadable" extension type fact sheets be useful?
- Should taxonomic keys be extensive or more focused on keys to the most important species in easily understood language?
- Once on-line, how should potential users be identified and informed of the system's availability?

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Integrated Pest Management in Horticultural Crops in East and Southern Africa: Activities and Experiences of GTZ IPM Horticulture Project

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Introduction

Albeit the importance of horticulture has recently rapidly increased in the economies of most countries in the region, national agricultural research institutions accord a medium to low research priority to the sector and there is barely any research support by the industry. Worse still, despite the current awareness of the hazards of pesticides to human health and environment, and imposition of maximum pesticide residue levels by EU countries, IPM research on vegetable and fruit crops has a very low profile as reflected by a small number of on-going IPM projects in east and southern Africa. In addition, most work on IPM in the region is carried out by projects funded by international donors. For example, in Kenya there are three IPM projects for vegetable crops separately funded by DFID, USAID, and GTZ, whereas national institutions focus mainly on alternative crop protection measures and/or individual IPM components. For the last four years GTZ IPM has been supporting research activities on cabbages, citrus, french beans, and tomatoes in Kenya, Malawi, Mozambique, Tanzania, Uganda, Zambia, and Zimbabwe.

Activities and Their Status

Surveys

- Crop protection measures of Kenyan vegetable farmers and their use of pesticides: knowledge, attitude, and practices (done);
- French beans production by small-holders in Kenya: pest status, plant protection practices, economics, and role of gender (done);
- Diseases and insect pests of citrus in the region (done); and
- Virus diseases of tomato in Uganda (done).

Cabbages

- Seasonality of major pests and inventory of their natural enemies (completed),
- Intervention thresholds for diamondback moth in Malawi (completed),
- Aphid and DBM control using neem based pesticides (completed),
- Chemical control of *Hellula undalis* in Mozambique (completed), and
- Effect of neem based pesticides on beneficials (on-going).

Citrus

- Pilot biocontrol program against citrus woolly whitefly in Uganda (on-going) and
- Biocontrol of citrus woolly whitefly in the region (expected to start in 1998/1999).

French beans

- Seed treatment for control of aphids and beanflies (completed),
- Chemical control of bean flower thrips (completed),
- Bio-ecology of bean flower thrips (on-going),
- Seed treatment for control of bean rust (completed),
- Relationship between time of rust infection and yield loss (completed), and
- *Fusarium* root rots management (seed/soil treatment and organic amendment) (completed).

Tomatoes

- Tomato viruses and management in Uganda (on-going),
- Late blight management in Kenya (completed),
- Screening accessions/varieties for resistance to root knot nematodes in Zimbabwe (on-going),
- Screening accessions/varieties for resistance to late blight (in collaboration with AVRDC-ARP; to start in 1998/99),
- Management of Fusarium wilt with neem cake powder (completed), and
- Resistance screening to red spider mites (ICIPE/GTZ; 1998).

Training

- Diseases and insect pests of citrus (regional; done),
- Biocontrol of citrus woolly whitefly (regional; done),
- Diagnostics of vegetable viruses (funded participants to AVRDC-ARP; done),
- Thrips identification (regional; done),
- Training of trainers course on IPM for french beans in Kenya (done), and
  Farmer groups on IPM for french beans in Kenya (1998/99).

Efforts on Communication and Dissemination of Information

GTZ IPM has accessed computers, e-mail, and internet connections to collaborating institutions in four countries. This includes sustenance for services and facilities for the duration of the project. This is to ease communication flow between researchers/stakeholders within and between countries and to facilitate exchange of research information worldwide.

GTZ IPM with CIAT are working on a CD-ROM on bean production. The project has also discussed with ICIPE and other international institutions on possibility of producing a similar CD-ROM on cabbage production. In addition, training, both formal and hands on as earlier outlined, is given a priority. The project to-date has trained eight Msc and has three PhD students.

GTZ IPM is active in sensitizing IPM ideals in an attempt to create public awareness in various horticultural fora, local journals, and dailies.

Experiences/Constraints to Implementation of Activities

- Farmers are amenable to accept new concepts in their management system(s) if they are actively involved in problem definition and problem resolution;
- Farmers always want to know the economic benefits derived from the IPM package or its components;
- Farmer needs are not restricted to pests only. Issues of soil fertility, water management, agronomic practices, and nursery production always arise;
- Overly high expectations by some collaborating institutions in terms of scale of funding, formal training, high subsistence allowances for personnel, and other assistance not related to project mandates;
- Lack of motivation by some NARES personnel;
- Researchers are not proactive in soliciting for funds;
- Farmers and other stakeholders expect research findings in too short a time;
- Farmers expect free provision of inputs, and in some cases, loans;
- IPM has not been adopted as the official policy for crop protection in most countries in the region;
- Lack of coordination and exchange of information between operating IPM projects within and between countries in the region;

- Lack of IPM awareness by extensionists and farmers;
- Cautionary approach by farmers to change their traditional farming practices;
- Low educational background of farmers;
- Lack of appropriate extension materials;
- Poor communication infrastructure in rural areas;
- High costs of conducting farmer field schools; and
  Financial constraints inherent in projects of regional magnitude.

Conclusions

This forum should make concerted efforts to address issues of coordination of IPM projects/networks in the region, effective exchange of information between IPM institutions, sensitization of IPM to policy makers, public awareness of IPM ideals, and pooling and sharing of available resources in electronic connectivity and also in training of IPM practitioners, extensionists, and farmers. However, electronic media is not expected to have a direct impact as an effective IPM communication pathway on small-holder rural scenario primarily due to poor infrastructure and lack of resources and expertise in countries of east and southern Africa.

Telematics is a relatively new technology in the third world countries and, is therefore, looked upon with some sort of suspicion particularly at the higher institutional hierarchy. But, like all other communication media (radio;,telephone, telex, and fax) the cost effectiveness and other benefits of telematics will be recognized in matter of time.

Finally, it must be realized that this forum will not be in a position to change national government policies in terms of higher budgetary allocation for research and extension activities, and therefore, IPM projects have to use more efficiently the available resources. International sharing of information and technologies is one way toward achieving this goal.

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IPM Focus Information Partnership

Malcolm Iles

This workshop has been one of the first initiatives of the IPM Information Partnership. The Partnership is an association of international and regional organizations with a special interest in the use of Integrated Pest Management (IPM) in sustainable agricultural development. It was formally established with the signing of a memorandum of understanding, in October 1996. The MOU commits the partners to work collaboratively to achieve common goals. The partners comprise: The IPM Forum, IPMEurope, the Consortium for International Crop Protection, and the System-wide Program on Integrated Pest Management of the CGIAR, with CAB International joining later. All the partners are, in some sense, "umbrella" organizations representing a number of individual institutions, and all bring to the partnership significant information resources. Other organizations of comparable status with compatible objectives and philosophy are encouraged to join the partnership by mutual agreement.

The goal of the Partnership is to contribute to the progress of sustainable agricultural development and the pursuit of human well-being by making information related to the conduct of IPM more readily available to IPM practitioners working in the field of sustainable agricultural development.

Practitioners are here broadly defined to include the wide range of people involved in the process, including donors and other decision-makers, researchers, extensionists and farmers.

IPM Information Partners

IPM Forum

The IPM Forum (originally constituted as the International IPM Working Group) is an association of organizations and individuals involved in the practice of IPM in the context of sustainable agriculture, especially in developing countries. The Forum acts as a meeting point for the discussion of issues of special concern to IPM practitioners and seeks to harmonize international efforts to implement IPM. The IPM Forum plays a facilitating and coordinating role in promoting information exchange and training in support of IPM implementation. The Forum is especially concerned to empower regional groupings of IPM practitioners, strengthening links between national and non-governmental organizations and helping to provide these groups with a greater say in decision-making as it affects IPM.

The IPM Forum organizes two international planning meetings per year, plus additional regional or special-topic workshops. The Forum produces a quarterly newsletter in four languages which currently reaches several thousand practitioners worldwide. Human resources include a full-time Secretary-Coordinator, editor and information-scientist.

Consortium for International Crop Protection

The Consortium for International Crop Protection (CICP) is a non-profit organization, comprising 12 United States Universities and the US Department of Agriculture. Its principal purpose is to assist developing nations to reduce food crop losses through the use of environmentally-sound pest management approaches. To this end, the Consortium makes available the expertise of member organizations for a variety of policy-making and project implementation roles.

CICP has established an electronic information service, IPMNet, which offers a wide variety of publications and services. These include a newsletter, IPMNet News, bulletin boards, and an open database of available expertise, worldwide, in the broad field of IPM. CICP organizes workshops and conferences, carries out environmental assessments, provides technical assistance and is involved in various other activities related to IPM implementation. CICP has an executive director, administrator and secretariat and retains the part-time services of a newsletter

editor and a database manager.

CGIAR System-wide Program on IPM

The System-wide Program on IPM (SP-IPM) coordinates the IPM-related research of the international agricultural research centers of the Consultative Group on International Agricultural Research (CGIAR). One of its functions is to facilitate the exchange of information regarding this research among the International Agriculture Research Centre (IARCs) and their immediate partners and to make such information available to interested parties in the world at large.

The individual IARCs and the SP-IPM publish a variety of research reports and other informational materials on paper and on the Internet. The coordinating function of the SP-IPM, including an annual planning meeting and a full-time Secretary/Coordinator are supported by international donors. A database of current projects is being prepared and will be integrated with those of other IPMFocus partners.

IPMEurope

IPMEurope brings together European organizations with a special interest in IPM research and implementation in developing countries. Plenary meetings are held annually and planning meetings of the steering group more frequently. The functions of IPM-Europe are to influence policies and programs of European institutions and member organizations to promote a coordinated approach from European Union member states and the European Commission. IPMEurope has been particularly active in promoting collaboration and the exchange of information. The Secretariat for the IPM Forum also serves that function for IPMEurope. A major resource is a database of IPM projects currently being carried out or recently completed around the world with European support.

CAB International

CAB International is an international, intergovernmental organization owned by 41 developing and developed countries. For the past 80 years, in various forms, the Centre for Agriculture and Biodiversity International (CABI) has been providing information and technical support to world agriculture. Today, CABI has a mission to support development in the areas of agriculture, forestry, veterinary and human health, and in the conservation of natural resources.

CABI's crop protection activities, now organized through its division called CABI Bioscience, involve both research and support to IPM implementation from six centers in Africa, Asia, tropical America, and Europe. CABI's information activities include production of abstract journals, online services, Internet and CD-ROM services, drawing largely upon it three major abstract databases, CAB ABSTRACTS, CABI ACCESS, and CAB HEALTH, containing in all more than 3.5 million abstracts. CABI Information develops new products in crop protection, including the Crop Protection Compendium, on a project-driven basis. Its Information for Development Programme works in Africa and elsewhere to channel development assistance towards funding the provision of information (from CABI and all sources) to meet the needs of developing countries. CABI has recently begun to provide its information on the Internet (e.g. through CAB PESTWEB), and is keen to participate in the wider distribution of information useful to the crop protection community.

Objectives

In pursuance of its overall goal of providing timely, accurate, relevant information to the broad constituency of IPM practitioners involved in the implementation of IPM in the context of sustainable agricultural development, the IPMFocus has indentified the following immediate and specific objectives for this preparatory phase of the initiative:

- To improve access of IPM practitioners to electronic information published on the Internet - by establishing and maintaining an IPMFocus WorldWideWeb site as an user-friendly electronic access point to the broad range of IPM-related information available on the Internet.
- To identify the information requirements of different sectors of the IPM community in developing countries and evaluate means to satisfy these needs (with special concern for the interest of resource-poor IPM practitioners) - by conducting pilot studies of information dissemination and exchange in selected regions.
- To prepare an action plan for information exchange and dissemination, bridging the gap between electronic information resources and the needs of IPM practitioners in sustainable agricultural development (to be carried out under a future implementation phase of the project)

In formulating these objectives, the information partners recognize that the needs of researchers and policy-makers are already relatively well served by the recent developments in electronic information technology. A special effort is, however, now needed to ensure that the needs of farmers and/or their immediate intermediaries are better served. This will require attention to:

- infrastructure (in the sense of the linkages between individuals and organizations responsible for gathering, managing and disseminating the information);
- content (to ensure that the information carried responds to the full spectrum of needs of practitioners - not just to those of the research community which has generated much of the information currently available); and
accessibility (to ensure that suitably-presented material is available for delivery on paper, video, CD-ROM or other appropriate media).

The partners also explicitly recognize that they do not encompass all the necessary expertise to fulfill these objectives, nor is it the role of the IPMFocus to provide a comprehensive information service. Rather, IPMFocus will seek partnership with other groups having complementary expertise or already involved in compatible initiatives.

The present workshop can be seen as fulfilling a number of these objectives, or as moving in the direction of so doing. The outputs of this workshop will correspondingly guide the further development of Partnership activities.

Activities

IPMFocus WWW site

The Partnership has established, through the cooperative effort of the existing partners, a WWW site on the Internet. This currently provides a common access point to the web sites and Internet publications of the partner organizations and, through them (especially via the CICP/IPMnNet site), to a wide variety of IPM-related resources on the Internet. Partner organizations take responsiblity for ensuring that information in their own sites is accurate and current. For the purposes of this proposal, it is assumed that resources to maintain this basic level of information service are available to partner organizations from other sources.

Workshops

Focussing on Eastern and Southern Africa, the current workshop is a pilot. If it proves successful, further workshops are envisaged to build awareness and assess the needs of other regions.

Capacity building

The Partnership does not expect to seek or administer significant levels of funding, or resources such that it could directly support capacity-building. However, the Partnership could play an active, catalytic role in helping various interested client groups to build their networking capacity. This might, for instance, include preparing or assembling briefing materials that might be used by clients to try to improve the policy environment for networking in their country or region; or advice on design of networks or the writing of proposals which would help to mobilize resources to enhance communication and improve connectivity.

Conclusion

The activities outlined above are only intended to be preliminary and indicative of the field of interest of the partnership. The IPMFocus Information Partnership is at an early stage of its evolution and is explicitly intended to be responsive to the needs of IPM practitioners in developing countries. Partners therefore stand ready to implement recommendations of this and similar workshops in fields where they have the capacity and to play a facilitating and catalytic role in promoting wider implementation of IPM networking activities.

Agricultural development in this context is focused on production of crops and livesock, but includes related issues of pest control in the context of natural resource management, human health and the environment. Pests are broadly defined to include not just arthropod pests and vectors but the broad range of macro- and microoganisms believed to threaten the productivity of agricultural ecosystems.

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United States National IPM Network

R. Stinner
CIPM

Integrated Pest Management (IPM) promotes minimized pesticide use, enhanced environmental stewardship, and sustainable systems. This is achieved by protection of commodities with environmentally and economically sound practices and results in abundant and diverse supplies of food and fiber products.

The National Integrated Pest Management Network (NIPMN) is the result of a public-private partnership dedicated to making the latest and most accurate pest management information available on the World Wide Web. Participating institutions have agreed to a set of standards that ensure science-based, unbiased pest management information.

The backbone of the National IPM Network consists of web servers for each of the USDA defined regions (Southern, Northeastern, North Central, and Western) in the US. Within each region, participating institutions are providing state-specific or subject-specific information.

web site http://www.reeusda.gov/agsys/nipmn/index.htm

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Crop Protection Compendium: Its Utility in Africa

H. Munyua
CABI

The Crop Protection Compendium is an encyclopedic, multimedia tool that brings together a wide range of different types of science-based information on all aspects of crop protection. It encompasses not only pests, diseases, and weeds and their natural enemies, but also the crops that are their hosts and the countries where they occur.

It is comprised of information obtained from experts, edited and compiled by an independent scientific organization, and resourced by a diverse international Development Consortium. It is published on CD-ROM, linked to the World Wide Web, and kept up-to-date with new editions of the CD-ROM published annually.

Module 1 was published in 1997 and updated in 1998. This unique, comprehensive resource presents full data sheets on over 1,500 pests, diseases, weeds, and natural enemies of worldwide or regional importance, each with text, illustrations, and distribution map. Outline data are available for 10,000 species, all contained in an intelligent taxonomic framework. A novel system of hyperlinking allows dynamic links to be created in real time.

Data for more than 150 crops and 150 countries are included, with global and regional distribution maps. Arrangement of the content in a large relational database facilitates identification of potential plant disease/pest problems and points to control methods.

Other features include: diagnostic keys, personal and corporate notepads, texts of useful documents, a large bibliographic database, economic and statistical databases, a glossary, connections to the internet ,and a self training guide.

It will be of use to crop protection specialists, extension officers, quarantine officers, crop managers, plant breeders, policy makers, research scientists, lecturers, students, and workers in the agrochemical, seed and biotechnology industries.

It has potential uses for disease identification, preparing extension literature, pest risk analysis and as a reference tool. The content is readily available for use in applications outside the Crop Protection Compendium.

web site http://pest.cabweb.org/cpc/cpchp.htm

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Database of IPM Resources (DIR)

W. Bajwa
IPPC

The Database of IPM Resources (DIR) is an information retrieval/referral system and a compendium of customized directories of worldwide IPM information resources accessible through the internet. With DIR, one can quickly find the way to thousands of IPM information sites. The DIR presents these web resources in a logical, structured, and searchable way that greatly reduces the frustration and disappointment often encountered when using general search engines on the web. The DIR covers a wide array of crops, pests, control tactics, regions, organizations, and related topics in a user-friendly format. DIR's contents span most of the disciplines involved in IPM.

web site http://www.IPMnet.org/DIR/

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Africa IPM Link and IPM CRSP

J. P. Amirault and B. Gebrekidan
IPM CRSP

Africa IPM Link is a project of the IPM Collaborative Research Support Program (IPM CRSP), managed by the Office of International Research and Development (OIRD) of Virginia Polytechnic Institute and State University (Virginia Tech) in Blacksburg Virginia, through funding assistance from the United States Agency for International Development (USAID) Bureau for Africa, Office of Sustainable Development (AFR/SD).

The goal of Africa IPM Link is to foster the initiation and implementation of a network of IPM practitioners in sub-Saharan Africa by facilitating their access to the latest electronic communication and information exchange tools. This responsibility was further endorsed by participants of a workshop held in Ethiopia in October 1996, jointly organized by the IPM CRSP and the Institute of Agricultural Research in Ethiopia, now known as the Ethiopian Agricultural Research Organization (EARO). The project focuses on seven countries; Mali, Senegal,Ghana, Uganda, Kenya, Ethiopia, and Zimbabwe.

To help it reach this objective, Africa IPM Link is working in collaboration with AfricaLink, a (USAID) initiative to facilitate access to the Internet and training for its colleagues and partners in Africa, and with the Consortium for International Crop Protection (CICP), a non-profit organization whose basic goal is to advance economically efficient and environmentally sound crop protection practices in developing countries.

IPM information sources on the World Wide Web are numerous and diverse; see for example the information which can be found on the National IPM Network's National Server (USA). On the other hand, sources in French are scarce. Therefore, in a first phase, Africa IPM Link has addressed this problem by creating a web page of IPM resources in French.

Internet access in Africa is evolving rapidly. It is clear that many non-governmental agencies and African researchers in the private, public, and academic sectors will have internet access in the very near future. However, penetration varies greatly from one region to the next. This is why Africa IPM Link is also looking to combine other strategies for the effective dissemination of IPM information. Any strategy that will bring practical IPM information directly to the farmer, regardless of the scale of his/her production, will be considered. These strategies will be developed in close collaboration with African partners in each region. Once established, African collaborators will take full control over the evolution of their IPM network.

web site **http://www.cals.vt.edu/ail/index.html**

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Cassava IPM Information and Its Transfer in West Africa

Braima D. James
IITA-Cassava IPM project

At the International Institute of Tropical Agriculture (IITA), the main structures of IPM information transfer are various projects executed in partnership with National Agricultural Research and Extension Systems (NARES). One of these projects is the "Integrated Management of Cassava Pests and Diseases" (Cassava IPM). Cassava is increasingly an important food and income source in Sub-Sahara Africa (SSA). However, pests (arthropods, vertebrates, pathogens, and weeds) and poor agronomic practices reduce cassava crop production by an estimated 50 percent. The diversity and geographic range of the pest constraints require comprehensive research to develop and implement holistic intervention technologies that sustainably increase yields, through improved cassava plant health and by ensuring good production environments. The primary objectives of cassava IPM projects are therefore to identify and characterize cassava plant protection constraints; estimate pest induced losses; develop, test, and implement pest control technologies and estimate their impact; and train national program staff and farmers in the principles and practices of ecologically sustainable cassava crop protection.

In its implementation, the cassava IPM project integrates inputs from IITA core and special project activities. In 1993-1997, the special project, "Ecologically Sustainable Cassava Plant Protection" (ESCaPP), was the major component of the umbrella cassava IPM project. ESCaPP was the African component of a United Nations Development Program (UNDP) sponsored project to develop, test, and adapt sustainable cassava plant protection technologies for the most important pests found in West and Central Africa and in South America. ESCaPP was executed by IITA: Plant Health Management Division (PHMD) in collaboration with multidisciplinary teams from the NARES in Benin, Cameroon, Ghana, and Nigeria. The South America component of the project, known as PROFISMA (Proteçào Fitossanitàtaria Sustentàvel da Manioca na América Latina e Africa) was executed by CIAT (Centro Internacional de Agricultura Tropical) in collaboration with EMBRAPA (Empresa Brasileira de Pesquisa Agropecária) in Brazil. Partners in the cassava IPM project are researchers, extension trainers and extension agents, and farmers.

This paper summarizes the IPM information and related materials generated by the project, discusses farm-level training as a main channel of information transfer for sustainable food production, and suggests a few ways of increasing the effectiveness of information and skills transfer for IPM.

Cassava IPM Information

IPM information and materials generated by the Cassava IPM project are in various stages of finalization for public use and include:

- An extensive diagnostic survey protocol, standardized to facilitate assessment of cassava pest diversity, incidence, abundance, and severity;
- Geo-referenced distribution maps of cassava plant protection constraints, agronomic and socioeconomic features, and farmer practices. The maps are based on databases of multi-disciplinary diagnostic survey results in Benin, Cameroon, Ghana, and Nigeria. GIS maps of the distribution and characteristics of CMD in Uganda and the wider Lake Victoria basin are also available;
- A cassava plant protection information CD-ROM consisting of a directory of personnel, projects, and institutions; images of pest and natural enemies; cassava bibliographies; taxonomic resources; databases of cassava mites of Africa; the series of CIAT/IITA cassava newsletters. Some of these documents have been placed on a World Wide Web site (http://hammock.ifas.ufl.edu/cassava/5303). The personnel database will be updated to include NARES researchers, extension staff, and other participants trained in cassava IPM;
- A cassava IPM training curriculum based on assessed technical information needs of national extension trainers (Subject Matter Specialists/SMS; Techniciens Supérieurs/TS). The curriculum presents eight modules addressing identified gaps in participant's knowledge and skills in the principles and practices of cassava plant protection. It also describes existing extension and farmer training

delivery systems in the countries. The curriculum formed the basis of CASSAVA IPM collaboration with the national extension services for in-service training of 194 SMS/TS in Benin, Cameroon, Ghana, and Nigeria. It can be adapted to facilitate pre-service training in cassava plant protection of this category of extension staff;

- Four cassava IPM field guides: "Starting a Cassava Farm," "Weed Control in Cassava Farms," "Pest Control in Cassava Farms," and "Disease Control in Cassava Farms." The materials are designed to promote the understanding and application of cassava IPM technologies and practices by extension agents and farmers. The guides were field tested by extension trainers in Benin, Cameroon, Ghana, and Nigeria. A source book, based on these guides, is being finalized to serve as technical reference manual for use by extension trainers (SMS/TS);
- Four posters to increase cassava IPM awareness, encourage good cassava IPM practices by farmers, and facilitate farmer training by extension agents. The posters were field tested by farmers groups in Benin, Cameroon, Ghana, and Nigeria;
- Technologies suitable for decentralization include: cassava-tunnel and cassava-tree production systems for local mass production of natural enemies for biological control of introduced cassava pests; ELISA- and PCR-based CMD diagnostic technology to detect new cassava mosaic virus variants; and
  Various research data exist on yield loss on CMD pandemic in Kenya, CBB, cassava brown streak disease in Tanzania and Malawi; and the epidemiology of plant pathogens and their vectors in diverse agroecologies.

IPM Information Transfer Through Training

Training by the cassava IPM project aims at updating the knowledge and skills of NARES researchers, extension trainers, extension agents, and farmers in the theory and practice of plant protection. Prior to the ESCaPP project (1988-1992) IITA provided 558 (group, in-/inter-country and refresher) training courses and 54 degree-related training to NARES personnel. The training interventions, with accompanying "take-home" print materials and field kits, assisted NARES staff to contribute significantly to IITA's achievements in classical biological control.

In 1993-1997, cassava plant protection training concentrated (largely through ESCaPP inputs) on in-country and field-based training of extension trainers, extension agents, and farmers' groups. The extension services that collaborated to incorporate the training into their existing national operations were Centre d'Action Régionale pour le Développement Rural (CARDER) in Benin; National Agricultural Extension Training Programme (NAETP) in Cameroon; Department of Agricultural Extension Services (DAES) in Ghana; and Selected Agricultural Development Programs (ADP) in Nigeria.

These extension services adopt the unified extension system (largely external donor driven) with its built-in training and visit (T&V) approach for information flow to farmers. The T&V approach emphasizes frequent short duration training workshops in each annual production cycle for continuous contact with large numbers of extension trainers, extension agents, and farmers. T&V training methods are commonly group discussions and farmer/farm visits. Rural radio broadcasts (e.g. in parts of Cameroon and Nigeria) reinforce T&V messages. In needs-assessment exercises by the ESCaPP project, extension trainers and extension agents indicated preference for print materials ("take-home" items, e.g., posters, field guides, and factsheets) for use as reference and field materials in their work. While both categories of extension staff were conversant with cassava agronomy, they lacked adequate prior knowledge in cassava plant protection. In 1993-1995, ESCaPP conducted six sets of in-country refresher courses for 194 extension trainers (SMS/TS) in Benin, Cameroon, Ghana, and Nigeria to up-grade their technical knowledge in cassava plant protection and equip them with skills and materials needed to effectively train extension agents and farmers. Within two years following the refresher courses in the four countries, the trained SMS/TS reached at least 1,800 extension agents who in turn reached at least 2,400 farmers groups with new cassava plant protection message.

There are various positive and negative views and convictions on the T&V system. No matter which perspective one holds, it is worth noting that T&V is currently institutionalized in many African countries and in various stages of modifications to suit national needs. There is an obvious need to review the linear model of information transfer in the T&V approach. In this regard, ESCaPP and its partner extension services and a few NGOs initiated at least 25 cassava Farmer Field Schools (FFS) for action learning and research by farmers in Benin, Cameroon, Ghana, and Nigeria. FFS farmers conducted experiments to test information and technologies, generate new information, coin local names for pests, and in at least one FFS site (in Cameroon) participate in biological control releases and post-release monitoring.

Some extension participants viewed the cassava FFS experiments as extended versions of existing T&V "Small Plot Adoption Techniques" (SPAT). SPAT focuses on single individual farmers/farm families in diverse locations, but FFS brings together large numbers of farmers to work on a number of prioritized constraints. On the whole, cassava FFS were well received by farmers and participating extension staff for IPM information testing and transfer, skills development, and general human resource development.

FFS and similar participatory training models would need to be widely accommodated within the unified extension systems if their usefulness is to extend beyond the level of individual projects. This task would require policy considerations to:

- Address the re-deployment of large numbers of extension agents whose (T&V) roles would become "redundant" as farmers become more informed through action learning and research and involved in horizontal transfer of agricultural information and
  Review pre-service training curricula of extension trainers/agents to emphasize the facilitation and community consultation skills required to understand the organization and functioning of farmers' groups in action learning and research.

Concluding Suggestions

A number of lessons can be learned from the cassava IPM project to increase the effectiveness of IPM information and skills transfer.

- Focus on human resource development. Agricultural information transfer relies largely on knowledgeable and motivated people. There is therefore a strong need to emphasize training of field/extension agents who are the main "agricultural information consultants" at farm-level and to integrate their training with research in IPM projects. Agricultural pre-service training curricula of national universities, colleges, and research institutes would also need to be reviewed regularly to capture emerging technical needs. Such institutions would need to invest in electronic communication media for quick access to IPM data, materials, and national and international expertise. This

pre-supposes the existence of reliable telephone lines and electricity to power computers and faxes;

- Institutionalize participatory training approaches in national extension systems. Participatory approaches to information generation and transfer will greatly increase the understanding and adoption of training and extension information materials and encourage the integration of indigenous information and knowledge in technology development. Multiple copies of undistributed information materials are most probably those developed in a linear fashion, "on-behalf" of the users;
- Treat the development of information resources as integral components of IPM projects. Assistance from specialized centers may be needed to adapt selected print materials into multimedia IPM software on growing a healthy crop. Such assistance should include training of appropriate NARES staff in the art of preparing didactic materials to foster a "self-help" approach to training material preparation at national level;
- Establish a thematic network on IPM to ensure structured access to information and materials by a wider range of stakeholders. Regional coordinating structures or mechanisms help to ensure that IPM practitioners in partner countries are not isolated from each other and have equal access to technologies, information resources, training opportunities, and expertise. For biological plant protection issues, the Technology Testing and Transfer Unit (TT&TU) of IITA had assisted several African countries to establish National Biological Control Committees (NBCP). Also, in recent years, a number of regional nodes of Bio-NET INTERNATIONAL have been created or proposed in Africa to handle biosystematic resources. NBCP and pertinent nodes of Bio-NET INTERNATIONAL could form the building blocks of formal regional thematic networks to promote IPM information and material transfer to the countries. Formalization of such a network would require active consultation with the regional bodies CORAF, ASARECA and SACCAR which are responsible for ensuring that agricultural research and development agenda reflect the needs of the respective regions.

Acknowledgements

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International Centre for Insect Physiology and Ecology (ICIPE)

BioNET-INTERNATIONAL: Biosystematic Support Services to IPM

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For the achievement of food security and sustainable use of genetic resources, more scientific approaches to agriculture, such as Integrated Pest Management (IPM), nature conservation, and the preservation of global biodiversity are required, and are being implemented. These have increased the demand for biosystematic support services, and this has come about at a time when many international institutions are scaling down their activities. Consequently, many developing countries are facing a critical shortage of taxonomic (biosystematic) support, which is known as the taxonomic impediment.

We need to overcome this obstacle in order to develop and implement scientific approaches to food security, the sustainable use of sustainable resources, and for governments to meet their obligations to the Convention of Biological Diversity. The only functional program for the improvement of biosystematic services, that I am aware of, in southern and East Africa that is applicable to pest management, and other aspects of agriculture, in the developing world is BioNET-INTERNATIONAL. BioNET-INTERNATIONAL was specifically designed for this purpose. There are other similar programs that deal with higher plants.

What is BioNET-INTERNATIONAL?

- It is a global network for biosystematics, which is currently concerned mainly with invertebrates and microorganisms, but which may include other groups to enable the achievement of its overall objective.
- It comprises interlinked sub-regional LOOPs that are made up of developing country institutions. A LOOP being an acronym for a Locally Organized and Operated Partnership, and they generally comprise neighboring countries that have undertaken to cooperate in a reciprocal way.
- The LOOPs are supported by a consortium of developed country biosystematic institutions, known as BIOCONs, which are involved in the transfer of biosystematic skills to appropriate centres of excellence in the developing world.
  The program is managed by the BioNET-INTERNATIONAL Consultative Group (BICC), through its Co-ordinating Committee (BICC), and its Technical Secretariat (TECSEC). The latter provides technical support to enable the LOOPs to achieve their objectives within a reasonable time frame.

BioNET-INTERNATIONAL'S Objectives

BioNET-INTERNATIONAL proposes to mobilize and pool the world's biosystematic resources and strengthen institutions that provide biosystematic services. By the relocation and amalgamation of biosystematic resources of all kinds, BioNET-INTERNATIONAL believes that the existing resources will be used to their fullest and will be better preserved.

This will take place through the transfer of knowledge, skills ,and technology. Here, TECSEC may play an important role in facilitating this transfer, if it is required. The ultimate aim is to enhance biosystematic capabilities within developing regions in an economic and sustainable way.

Local Structure of BioNET-INTERNATIONAL

Each LOOP functions as follows:

First, the members of a LOOP are neighboring countries. Within each member country, institutions involved in either providing or receiving biosystematic capacity may join to become National Institutes (NIs). The activities of the NIs within each country are coordinated by one NI, chosen by the country concerned, known as the National Coordinating Institute (NACI);

The LOOP as a whole is coordinated by an NACI in one of the member countries, known as the Network Coordinating Institute (NECI). The NIs are encouraged to communicate freely with each other in the provision of biosystematic services. Coordination in the development of biosystematic capacity, however, should be dealt with through the NACI. Sub-regional coordination, with outside organizations, such as TECSEC, are dealt with by the NECI, which acts as the executive arm of the LOOP.

BioNET-INTERNATIONAL Work Programs and Achievements

SAFRINET has five Work Programs

Information and Communication Services

For Communications we have supplied most of the NACIs with a computer with e-mail facilities to facilitate communication between the NACIs and between the NACIs and the NECI. Namibia developed a SAFRINET web site, the address is

http://www.natmus.cul.na/safrinet/main.html.

For Information services, each country has been supplied with the CABI Crop Protection Compendium and the CABI root knot nematode CD.

Training in Biosystematics

Thirty-four persons, mostly technical, received training in the skills required to develop and maintain specimen collections in insects, arachnids, fungi and nematodes. Copies of the training manuals will be distributed to all the BioNET-INTERNATIONAL NIs.

Rehabilitation of Collections and Establishment of New Resources

SAFRINET has undertaken a Needs Assessment Exercise to establish what collections exist, identify centers of excellence, collections where relocation and amalgamation should be considered and centers of excellence that should be developed further.

Through this process we have also established a network for the provision of biosystematic services. The purpose of establishing the network at this early stage is to enable us to identify our strengths and weaknesses more accurately and, more importantly, to enable the researchers, farmers, extension officers, etc. of the day to benefit from the existing biosystematic capacity.

Development and Application of New Technologies

SAFRINET has developed two new electronic media: An electronic key to the nematode genera in southern Africa; the CABI data sheets on fungi and bacteria having been placed on a CD. We have also purchased a copy for each country of the following CABI products: Keys to the adults of the beetle families; aphids of world crops; soil dwelling termites, and the ANI-CD.

Conclusion

SAFRINET is advancing with increasing momentum, primarily due to a group of dedicated people who have committed themselves to making the project a success. This group includes both users and providers of biosystematic services. Because of the global concern with regard to biosystematic capacity SAFRINET, in the short period in which it has been operational, has become an influential body in biosystematics, and related fields. This has become evident by several independent people asking SAFRINET to endorse their projects so that they may receive greater recognition by their association with SAFRINET. These people have not requested financial or any other form of support from SAFRINET. All they require is an approval from a body they consider to be influential. Such endorsements are not part of the SAFRINET program and were not

propagated.

I encourage those who reside in SADC member countries to become involved in SAFRINET, as the more you contribute the more you will benefit. I also encourage those of you from other sub-regions to become involved in your respective LOOPs of BioNET-INTERNATIONAL, and if such has not yet been established to consider the implementation of BioNET-INTERNATIONAL's ideas a priority.

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Global Plant and Pest Information System (GPPIS)

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FAO created the first electronic, interactive, multimedia compendium of plant protection information in 1987. The current Global Plant & Pest Information System (GPPIS), is an Internet/WWW based version of FAO's earlier work. GPPIS is a global implementation and extension of the Pacific Plant Protection Information System (PPPIS) developed by FAO and the South Pacific Commission (SPC). GPPIS replaces PPPIS and fulfills FAO's constitutional mandate in the area of nutrition, food and agriculture, which calls on the Organization to:

- promote the common welfare by furthering separate and collective action among its Members;
- collect, analyze, interpret, and disseminate information by serving as a forum through which Members will report to one another;
- promote improvement of education and the spread of public knowledge;
- conserve natural resources;
- promote scientific, technological, social, and economic research; and
  provide technical assistance as requested by its Members.

GPPIS is a learning system as well as a system for learning. It is not a single, one-time, printed product that requires regular reprinting of new editions. Instead, it establishes a set of standard methods and protocols for data collection and maintenance under password-protection. This creates a dynamic framework for collective knowledge processing that can be implemented in a variety of cross-platform environments on the Internet, in local Intranets, and as a stand-alone database on CD-ROM.

GPPIS data and source code are in the public domain because they are created and maintained by the community of individuals who choose to participate in the evolution of GPPIS. Contributions by sponsors and supporters are voluntary and motivated by the realization that individual action is the best way to motivate others similarly to share their individual expertise.

GPPIS is inconceivable without the Internet. It is a dynamic, interactive, digital implementation of the traditional approach whereby a group of authors band together to publish a multi-author book. Like journals and books, GPPIS has a Supervisor, who welcomes your comments; editors, referees, and critical readers; and GPPIS uses the same peer review processes employed by refereed journals. However, individual pieces of information are not bought or sold. GPPIS data and source code are in the public domain and not copy righted. The collected sum of information belongs to everybody because the task of providing data and keeping the information current and accurate is distributed globally. Every time an individual GPPIS user contributes his time and knowledge, he gains access to the sum of all similar contributions.

You are welcome and invited to participate.

web site http://pppis.fao.org/

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Acacia: Communities and Information Societies in Africa

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The Acacia Initiative is an international effort led by the International Development Research Centre (IDRC) to empower sub-Saharan African communities with the ability to apply information and communication technologies to their own social and economic development. It is expected to involve significant funding during its first five years and to grow to maturity over the first quarter of the 21st century.

Vision

Information and communication technologies (ICTs) have transformed the way people in the industrialized world manage their professional and personal lives. Acacia will test the proposition that ICTs can also have significant transformational effects in the developing world. By utilizing ICTs to their own ends, disadvantaged communities in Africa may be able to shift some of the decision-making away from metropolitan centres and international development organizations towards the places where development challenges are faced most acutely.

Acacia has been designed and is being led by Canada's International Development Research Centre (IDRC). IDRC is a Canadian public corporation, created in 1970 to strengthen research and information capacities in the developing world, and to assist developing countries in addressing their own problems more effectively.

IDRC's experience and competencies reinforce its reputation as an organization that has responded to global development problems. Over its 25-year history, IDRC has made significant investments in research, capacity building, and information and communication throughout the developing world. In fact, the Centre was among the pioneers in the adaptation and use of ICTs in Africa, and Acacia will build on IDRC's existing and emerging networks, programs, and partnerships.

One key partnership is with the African Information Society Initiative (AISI), which unites African governments and donors in a framework to extend the use of information, communication, and related technologies for development. Led by the UN Economic Commission for Africa, AISI provides a uniquely African perspective on the opportunities and challenges of that continent in an emerging information age. Acacia can be seen as a Canadian contribution towards helping sub-Saharan Africa meet the objectives of AISI.

Acacia will work mainly with rural and disadvantaged communities, and particularly their women and youth groups. Often these communities find themselves isolated from the ICT networks to which their urban counterparts increasingly have access. Yet, at the same time, these communities demonstrate enormous creativity and enterprise living in an environment with little in the way of services and information. With Acacia, IDRC intends to support this creativity and enterprise by demonstrating the benefits of a local capacity to use information and communication in solving local development problems. By sharing information and communicating among themselves and with others, these communities can hopefully remove certain barriers to development and speed up its progress.

Context

During the 1980s and early 1990s, many countries in sub-Saharan Africa underwent transitions from single party to multi-party political systems and to younger, often more progressive leadership. More recently, sub-Saharan Africa's gross domestic product (GDP) grew by 4.0 percent in

1995, a significant improvement over the 1.4 percent average for the period 1991-1994. At least 15 countries grew by five percent or more in 1995, some (like Angola, Lesotho, Malawi, and Uganda) experienced growth rates in excess of 10 percent, while others (Burundi, Congo, Seychelles, Sierra Leone, Somalia, Zaire, Zambia, and Zimbabwe) registered declines. In total, 30 countries accounting for 61 percent of the region's population recorded a positive per capita income growth in 1995.

Many African governments have also reformed their communication systems in order to improve local and global information sharing. Yet, new technologies have the potential to further widen existing gaps between the elite and the poor within African countries. While some sectors are adopting ICTs, for the most part they are overwhelmingly used by the wealthier and predominantly urban elites. The reality in 1995-1996 was that sub-Saharan Africa (excluding South Africa) had only 4.8 telephone lines and 142 radios per 1,000 inhabitants. South Africa was noticeably different, with about 94 telephone lines and 290 radios per 1,000 inhabitants. That country can account for nearly 60 percent of all lines installed in sub-Saharan Africa (31% of the lines in the whole continent). Yet even in South Africa, there are huge disparities among different sectors of the population. Some parts of the Eastern Cape, for example, have teledensities similar to those of other, less fortunate, sub-Saharan African countries.

Objectives

Acacia aims to achieve three mutually reinforcing objectives that combine to promote equitable, sustainable, and self-directed development among disadvantaged and rural communities in sub-Saharan Africa:

- to discover and demonstrate how disadvantaged sub-Saharan African communities, especially their women and youth, can use information and communication in solving local development problems;
- to learn from Acacia's research and experience and to disseminate this knowledge widely; and
  to foster international interest and involvement in using ICTs to support rural and disadvantaged community development, thereby increasing community access to information and communication.

Outputs

A highly visible Acacia output will be 'connectivity' within communities. Less visible but equally important are the human and organizational capacities to understand and use this connectivity, and the access to the ICT-based tools, information, and knowledge, which this connectivity brings.

Initially, the main delivery mechanism for this connectivity will likely be some form of community 'telecentre,' a location that facilitates the provision of a wide variety of public and private goods and services, and therefore supports local economic and social activities. Such services might include basic communication such as voice, fax, e-mail, Internet access, etc.; public and quasi-public sector services such as tele-medicine, distance education, municipal governance services, etc.; and private sector services like news distribution, tele-commuting services, training, information on markets, crops and weather conditions, and much more.

Acacia will explore the capability of different telecenter models to meet real community needs, to generate income opportunities, and to develop markets for information products and services. Various types of ownership and financing arrangements will be examined, including public, private, and community models. Specialized telecenters for specific applications may be located in schools, clinics, local government offices, or other facilities. Different financial arrangements may lead to locations in community centers, post offices, and small businesses. Acacia will document and analyze the various alternatives, draw out the lessons learned from each, and highlight best and worse practices.

Other specific outputs from Acacia will include:

- pilot projects which test different approaches to providing community ICT access;
- models showing how ICTs can be used to extend the reach of community voices in local planning and in all levels of governance;
- on-the-ground applications at community sites to meet health, education, natural resources management, and other local development needs;
- technology (software, hardware, and content) adapted for use in rural and disadvantaged communities;
- innovative infrastructure which extends networks at low cost;
- research into making ICT policy, regulation, and practice more friendly to those who are currently disenfranchised;
- new forms of partnerships in development assistance; and
  more effective utilization of research results by communities.

From a 25-year perspective, Acacia will play a major role in demonstrating the enabling power of new ICTs to end the perpetual state of inequality that characterizes underdevelopment.

Resources

With Acacia, IDRC has begun an ambitious program of action research, one which requires significant funding and a strong commitment to sustainability. Acacia must be large enough to create momentum, to demonstrate success in different cultural and socio-economic environments, and to offer incentives to replicate success. It must have the strength to continue after learning from both successes and failures, and it must survive long enough to determine and demonstrate that investments in ICTs can increase the development prospects of sub-Saharan Africa's marginalized.

Acacia does not pretend to provide sufficient resources to transform access to ICTs throughout sub-Saharan Africa, but the demonstration and learning objectives of Acacia involve a significant, long-term IDRC investment. The length of this commitment is important to bring the

transformational qualities of the new ICTs to the fore, and to leverage investments from governments and other donors.

IDRC's start-up commitment to Acacia is for:

- a planning phase (completed): $1 million CAD
- the first year of implementation (1 April 1997-31 March 1998): up to $8 million CAD
  additional investments projected for the subsequent four years, up to a potential total investment of $60 million CAD over five years.

Of course, Acacia will seek to mobilize significant resources from other donors, technical agencies, and the private sector. But as the lead agency, IDRC is expected to play a key role long enough to ensure a firm foundation for the program.

Program Strategy and Implementation

An Integrated Approach

Since access to and use of ICTs is a means not an end, Acacia must identify technologies and services that would be financially sustainable at the community level and efficient in responding to local needs. Yet, community-level sustainability depends on more than just elements under a community's control. Some of the factors influencing sustainability include the larger policy environment, the human talent pool available, the surrounding communications infrastructure, and so on.

As a result, Acacia has identified four key components (policies, infrastructure, technologies, and applications) that will govern the development of its programming and the selection of individual projects. Acacia will thus:

- foster ICT and telecommunication policies which are hospitable to ICT access in rural and small-town communities (e.g. changes in pricing policies, regulatory frameworks, the delivery of public information, and universal service/universal access);
- encourage and selectively support the development of human capacity and innovative technical infrastructure that extends communication networks to rural and small town communities (e.g. radio, satellite, cellular telephone-computer linkages);
- broker and support research and development (R&D) on tools and technologies that facilitate ICT use by the marginalized (e.g. graphic, touch-screen, and multilingual interfaces); and
  promote and support applications and services, which respond to specific community needs (e.g. enhancing the delivery of education, distributing health and agricultural information, and other applications defined by communities themselves).

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International Centre for Insect Physiology and Ecology (ICIPE)

Informatics

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What is PESTNET?

The Pest Management Research and Development Network (PESTNET) was established in 1986 under the initiative of ICIPE following discussions with several countries in East Africa. The Main goal was to improve the food security of developing countries in the tropics and sub-tropics, especially in Africa, by improving the control of insect pests of crops and vectors of human and animal disease through the development of IPM techniques by a network of concerned member countries.

PESTNET Objectives

- To generate information, knowledge, methodologies, and technologies in pest management strategies;
- To facilitate exchange of information, knowledge, methodologies, and technologies;
- To undertake multi-locational validation/standardization of information, knowledge, methodologies, and technologies;
- To strengthen and develop national scientific capabilities and skills in insect science.

PESTNET Strategies

- Research and development on components of IPM, including in-country adaptive research and technology;
- Training of scientists and IPM practitioners on short- and long-term programs and exchange visits;
- Information exchange through workshops, seminars, and national, regional, and international conferences;
- Establishment and operation of an information storage and retrieval system.

PESTNET Achievement

- PMDISS (Pest Management Documentation and Information System and Service) has been established and functioning;
- Participating countries: Burundi, Cote díIvoire, Ethiopia, Kenya, Malawi, Nigeria, Somalia, Sudan, Tanzania, Uganda, Zambia, and Zimbabwe;
- Several successful IPM projects in the member countries and many scientists/IPM practitioners received training in information exchange.

PESTNET Problems

PESTNET is not very active at present because of funding constraint.

Reason: (1) Project-based: UNDP-funded (1988-1992), No Core budget support for the essential infrastructure; (2) Single donor-funded initiative.

IPM Information Network and PESTNET

ICIPE/USAID Africa IPM Information Network Project (October 1996 to September 1998) is to establish and operate an electronic IPM information network to enhance the capacity of PESTNET for the generation and dissemination of IPM information to African users, which is co-funded by ICIPE and USAID.

Future Plan of PESTNET

Since the coming up of Insect Informatics research and development functions at ICIPE, the PESTNET function has been replaced by ICIPEís Insect Informatics Initiative, which consists of many projects related to information services to ICIPEís partners, collaborators and end users.

Insect Informatics R&D at ICIPE

What is Informatics and Insect Informatics?

Informatics is a subject dealing with applications of modern information technology. It is a term originated in Europe and now widely used worldwide. Many new subjects have been derived since then, like Medical Informatics, Nursing Informatics, Social Informatics, Bioinformatics, Health Informatics, Biomedical Informatics, Museum Informatics, Agrobiological Informatics, etc. Experts believe that the following 10 areas are most promising new Informatics products and business opportunities in future, which are Internet-based:

1. Digital Money	2. Digital Advertising and Sales Promotion
3. Digital Shopping	4. Education
5. Government Services	6. Videoconferencing
7. Telemedicine	8. Telebusiness
9. Entertainment	10. Information Services

There are two latest remarkable Internet developments: Internet vehicle and TV signals, which bring the web to PC through a TV tuner card.

Insect Informatics is a subject dealing with the generation, processing, and dissemination of insect information through the use of modern information technology. Insect Informatics applications are diverse: electronic insect records or checklists, CD products, decision-making support systems, networking, multimedia, imaging, information retrieval, management information systems, databases or knowledgebases, computer-based system, etc.

There are good opportunities of developing commercial insect informatics products, like CD products of multimedia insect information system, insect photo/image, insect checklist, insect cartoon book, insect cartoon video/movie, scientific insect movie/video, and commercial web site for insect information service.

Insect Informatics Initiative at ICIPE

Overall Objectives

- To generate, process and disseminate tropical insect information for sustainable development through the use of modern information technology.
- To strengthen the capacity building of Africa continent in Insect Informatics through establishing regional partnership/network and through training.

Justifications

Informatics has been revolutionizing the way information is being disseminated. More and more information has being disseminated electronically through Internet (Email or Web-browsing) or CD-ROM, with incomparable efficiency and convenience. Entomologists worldwide have started to develop insect information systems that can be disseminated electronically in recent years (Please refer to URL: HYPERLINK http://www.ent.iastate.edu/List/ http://www.ent.iastate.edu/List/ for details). However, comparing to other subjects, like medicine, nursery, social science, biotechnology, which have matured subjects dealing with Informatics research and development in these areas, Informatics activities in insect science areas remains at a primary and scattered level. There is an urgent need to develop an integrated subject: Insect Informatics for systematic and integrated development of Informatics research and development applications in insect science.

ICIPE as a research and development and training orientated intergovernmental organization headquartered in Africa, has conducted research and development and training on insect science for 26 years. ICIPE has been acting as a gateway or bridge between African partners/users and other parts of the world to process/disseminate insect related information to end users through regional partnerships/network. ICIPE has started several research and development projects to "re-pack" insect information in a user-friendly web-based format, which enable worldwide users to access ICIPE insect information online. ICIPE through its recent establishment of full Internet connectivity makes Insect Informatics Initiative more viable. Therefore, ICIPE is an ideal place to initiate Insect Informatics research and development.

Insect Informatics R&D Areas

- *Methodology-orientated:* Intelligent Decision-making Support Information System; GIS; Early Warning System; Expert System; Computer-based Advisory System
- *Information Dissemination-orientated:* Africa Regional IPM Information Network; Biocontrol (Trichogramma, Bt, etc.) Information System; Insect Biodiversity Information Bank; HyperMultimedia System on Harmful African Insects; Multimedia Educational Products on Insect
- *Commodity-orientated:* Horticulture; Apiculture; Sericulture
- *Pest-orientated:* Stemborer; Mosquito; Tsetse Fly; Tick; Fruit Fly; White Fly; Grasshopper/locust
- *System Development-orientated:* Virtual Biovillage; Community Pest Management through Multimedia; Agro-Ecosystem Simulation for Strategic Planning
- *Others:* Genome Informatics for Insects; Insect Visual Study

Features of ICIPE Insect Informatics Products:

- Friendly Web-based Interface
- Intelligent Decision-making Support
- Open and interactive to cover ICIPEís plus Worldwide Knowledge
- Learning from case data

Short-term/Medium-term Priority Projects at ICIPE

- Develop Intelligent Decision-making Support Information Systems for Stemborer Biocontrol (Ongoing).
- Integrated Horticulture Pest Management (Ongoing).
- African Sericulture Development.
- African Apiculture Development.
- African Vegetable Development
- Malaria/Mosquito Control.
- Develop an Insect Biodiversity Information Bank for Sustainable Management of Insects in Africa.
- Reduce Travel Risk in Africa through Establishing a HyperMultimedia Information System on Harmful African Insects.
- Establish Africa Regional IPM Info Network (Ongoing).
- Trichogramma/Bt Production/Application MIS.
- Community Pest Management through Multimedia.

Long-term Priority Projects at ICIPE

- Tsetse HyperMultimedia Management Information System.
- African Fruit Fly MIS.
- Information Promote Rural Development through Establishing Virtual Biovillage
- Insect Visual System for Behavioural/Development. Study

- Genome Informatics for Africa Silkmoth and Honeybee.
- African Tick Management Information System.
- African Grasshoppers/Black Locust Early Warning System.
  Multimedia Educational Products on Insect(Scientific Movie/Video, Cartoon, Game Etc.).

Informatics Expertise Required

- Databasing metadata: Apart from handling Vector or relational database, there is a need to database metadata using CORBA (Common Object Request Broker Architecture) and metadata standards CIP (Catalogue Inter-Operability Protocol) by CEOS (Committee for Earth Observation Satellites), or CSDGM (Content Standard for Digital Geospatial Metadata) by FDGC (Federal Geographic Data Committee).
- Web-based Graphical Applications: Open GIS, CGI/GUI, 3D/4D HTML.
- Programming: C++, JAVA, PERL, DHTML, ODBC, Scripts, and Macro.
- Intelligent Function Design: Modeling/Simulation.
- System Integration/Analysis/Overall Coordination.

ICIPE/USAID IPM Information Network in Africa (First Phase)

ICIPE/USAID IPM Information Network in Africa
IPM INFO-SEVER at ICIPE HQ

IPM Information Generation/Processing/Dissemination
ICIPE LAN

Internet Gateway
ICIPE IPM Information Networking Field Stations in Kenya

IPM Information Networking Partners in Uganda

IPM Information Networking Partners in Ethiopia

IPM Information Worldwide

Africa IPMLink, IPMNet/CICP, IPM/CRSP, IPM Europe, IPM Forum, CGIAR SP-IPM, IPM Globe Facility

IPM Information Networking Partners in Kenya

LAN Bridge

ICIPE/USAID IPM Information Networking in Ethiopia

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African Museum Networks—

Swedish African Museum Program (SAMP) and
International Council of Museums (ICOM)
African Museum Internet Project

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Windhoek, Namibia

Introduction

The Internet is an enormous, and seemingly limitless, virtual educational resource. However, we have to reflect on grim realities. How will developing countries in Africa and elsewhere ever, practically, benefit from the Internet? There are fewer telephone lines in the whole of sub-Saharan Africa than in downtown Manhattan, USA. On average, only one in every 3,000-5,000 persons have access to a telephone in Africa. While the Internet is increasingly endorsed and even supported by telecommunication agencies in most of these developing countries, a general pessimism prevails about the means of providing telecommunications (and thus Internet access) to their communities at large. National telecommunication systems are often antiquated, and require vast sums of money to repair and maintain, let alone expand into wider national networks. As a result, telephones are considered an unaffordable luxury by most people in Africa. The Internet is largely unheard of, and the vast educational resource on the Internet thus remains under-utilized.

This is where museums, libraries, and other educational community resource centers can serve as "windows" to this "virtual educational resource center." By being acknowledged and supported for their important role in this respect, by government, the public, and funding agencies alike, these institutions can provide access to the vast educational resource of the Internet to local communities. Museums, libraries, and other educational community resource centers are widespread in Africa. Thus, it seems sensible to provide these institutions with the means to Internet access, wherever possible.

Background

Many African museums have undergone major technological evolution in a very short time, and many of them no longer use the fax machine! There is now a very strong commitment to improve, even revolutionize, museum communication all over Africa. The support and enthusiasm thus far received for the African Museum Internet Project indicates serious intent on the parts of the African museum community, SAMP, ICOM, and, importantly, their funding agencies.

Current Status of African Museum Network

The following African museums presently have internet access as a result of the African Museum Internet project:

- Musée d'Art et d'Archéologie, Antananarivo, Madagascar
- Musée des Civilizations, Abidjan, Côte d'Ivoire
- Musée Nationaux du Mali , Bamako, Mali

- Musée d'Abomey, Abomey, Bénin
- Museu Nacional de Arte, Maputo, Mozambique
- National Museum of Namibia, Windhoek, Namibia
- District Six Museum , Cape Town, South Africa
- Swaziland National Museum , Lobamba, Swaziland
- Arusha National Natural History Museum , Arusha, Tanzania
- Village Museum, Dar es Salaam , Tanzania
- Moto Moto Museum, Mbala , Zambia
- Nayuma Museum, Limulunga , Zambia
- Regional Museum Network of Madagascar , Antananarivo, Madagascar
- Mutare Museum , Mutare, Zimbabwe
- Kisumu (NMK) Museum , Kisumu, Kenya
- National Archives & Museum , Victoria, Mahe, Seychelles

The following museums in Africa and Indian Ocean Islands are earmarked to gain internet connectivity in 1998 through the project:

- Centre National de Documentation et Recherches Scientifiques, Comores
- Regional Museum Network of Reunion
- National Museums of Algeria, Mauritius, Senegal, Morocco, Tunisia, Tanzania, Ghana, Gabon, Democratic Rep. of Congo, Ethiopia, and Angola

All of these museums are increasingly taking advantage of their internet facilities, with considerable savings in telephone bills, and overall communication costs. E-mail is increasingly being used by more and more staff at all the African museums. All you need is some expertise, huge volumes of enthusiasm, and "attitude!"

An Operational Framework

Dial-up internet service providers (IPs) are increasingly popping up all over Africa, and will provide the competitive edge to force prices down to more realistic levels in the next year or so (this has already happened, significantly, in Madagascar, Namibia, South Africa, Zambia, and Tanzania). While we have no formal agreement with UNESCO and other large NGOs, and thus have no access to their satellite channels, we will continue to be mostly dependent on local or regional commercial and academic providers. With the exceptions of some countries in southern and northern Africa, which may be able to hook up via their local universities (dictated largely by the competence of Server administrators at such universities), most universities, NGOs, and foreign agencies connect commercially or by international dial up (e.g., FIDONET).

Most of the museums now have 486 PCs or pentiums running Windows, external 28,800 bps modems and software such as Eudora and Netscape to handle most of their Internet needs. At most of the museums, two staff members were given initial training, which has continued in-house with other staff. Given corporate sponsorship, most of these museums will also have free homepages at their respective ISPs in due course.

Text based E-mail has been set as the absolute minimum standard, but where possible we have prepared museums for (imminent) upgrades. Connectivity at the African museums has been made as up-to-date as possible; i.e., if a local Internet provider offers dial-up PPP with Web browsing facilities, then the museum in question has been given immediate access to all of this, i.e., full-blown Internet connectivity. This has meant upgrading some museums' hardware (e.g., SVGA color monitors, more RAM, and Windows software), and providing modems of at least 14,400 bps, but preferably 28,800 bps.

It takes some time to get up the courage to really start using the internet. Importantly the coordinators and project members should regularly force E-mail exchange with newcomers; and do distance-teaching where necessary. It may be a good idea to introduce the email-based methods of "browsing" for those museums that will not immediately have (graphic) web- browsing capabilities.

Permanent leased-line connectivity should eventually be set up in those museums that can afford to pay the local telephone rates for such a leased line, are blessed with in-house computer expertise, and are willing to establish Web sites for the benefit of all museums involved. Some of the museums (National Museums of Kenya, Namibia, and South Africa) have advanced to a stage where they are willing (and able) to become local mirrors for critical global museum websites such as ICOM, the Virtual Museum Library Page, and the BioNet taxonomy network, and host distribution lists such as AFRICOM-L.

Whatever kind of internet connection is established, the project has insisted that this service should be freely available to ALL museum staff. All museum staff are encouraged and trained to use the internet facility provided. Where we strongly encourage museums to locate their internet equipment in their library or common room, the connection should at least be in the building, preferably in the office(s) of those persons who would make most use of it. Modems can be hooked up to a telephone line with local dial-up restriction (in the cases of local commercial providers), thus alleviating the risk of telephone abuse.

The service should be accessible 24 hours a day, seven days a week, even though most staff might only use it five days a week, during normal working hours. Most software can be programed to do an automated dial-up check/send mail at fixed times of the day and night. If there is considerable traffic at the IP's server, it is often wise to dial-up at night or very early in the morning. I know that a number of African museum staff have changed their work routines completely as a result of internet.

Wherever possible, providers who have a cost per volume charge should be avoided. It pays to shop around, and aggressively play on competition between the different providers, locally, and even regionally. Most providers are VERY keen to have a National Museum on their books, and

should be convinced to offer major discounts, corporate sponsorship, free homepages, free technical support, and bundled software, wherever possible. Importantly, the providers should have the technical know-how to help subscribers in distress.

The African Museum Internet project supports the museums for a period of two years with a subscription to whichever provider is chosen. This period of "grace" should be more than adequate to make each museum "dependent" on the internet connection, show considerable financial savings on more traditional modes of international/regional communication, and gives them enough time to convince their own bureaucracies to create appropriate internal budgets and funds for self-sustaining use of such internet connectivity.

The African Museum Internet Project has thus far been very successful, I think, and will hopefully continue to support a growing number of African museums in the future.

Proceedings of the Integrated Pest Management Communications Workshop: Eastern/Southern Africa

March 1-6, 1998, Nairobi, Kenya

International Centre for Insect Physiology and Ecology (ICIPE)

Self Help, Cashew Trees, and Learning in Rural Primary Schools, Nachingwea District, Tanzania

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Introduction

In Mtwara and Lindi Regions in southeast Tanzania, rural primary schools need to make money. Central and local government contributions for running and maintaining schools are insufficient, and school buildings and furniture are dilapidated and educational materials inadequate. Some schools are already taking part in pilot Community Education Fund schemes. In these, communities participate in prioritizing and planning what is needed to rehabilitate the school and contribute money and skills. The RIPS program encourages such schemes through matching the funds, which are collected by community and schools with an equivalent amount. In the area, most revenue is earned through sale of agricultural produce. Accordingly, many schools have begun to run agricultural projects with the principal aim of generating income. So far such projects have hardly been deliberately used to stimulate interest by pupils and parents in the standard education topics at the schools nor in specific agricultural topics. Yet, at the same time, interest in primary education among the rural population has waned as the education offered has increasingly seemed irrelevant to community needs and the stark realities of rural life. In 1997, in Nachingwea District in Lindi Region, several schools, which were trying to earn money by sale of cashew from their fields, took part in their own experiment to develop more profitable methods for controlling powdery mildew disease *(Oidium anacardii)*. This disease is a major cause of low yield in local cashew. The experiment showed how education and agricultural extension institutions can work creatively together. It offers valuable lessons on alternative teaching and learning methods and topics in village education. These suggest ways to rekindle the interest by children, parents, and village communities in the relevance of schools and the education on offer.

Controling the "Mist Disease"

In southeast Tanzania, awareness and use of sulphur dust to minimise the damage caused by powdery mildew (the "mist disease") has spread widely among the farming communities in recent years. This has been a result of widescale promotion of cashew rehabilitation by the World Bank (WB) — Government of Tanzania (GOT) Cashewnut Improvement Project. Schools have been keen to use this "wonder" chemical control method to increase their cashew nut harvests. But, farmers need considerable capital and various types of knowledge to use sulphur dust effectively and efficiently. Cashew farmers and rural school teachers have mainly had access only to information about generalized standard chemical control methods. They know much less about complementary cultural methods that can reduce the need for fungicide and improve cashew tree performance in other ways. Field agriculture extension officers, even if they in theory have more information on cashew management, have lacked techniques for making this information available for farmers to test, integrate into their own cultivation system, and use. As a result, schools, which started self-help agriculture projects, have often asked for financial assistance in order to buy sulphur dust and hire the necessary machinery to apply it. There has been no or little demand for other types of information and training on alternative and complementary cultural disease control and tree improvement management methods.

Economic Control of Cashew Powdery Mildew Disease *(Oidium anacardii)*

Research in southeast Tanzania shows that removal of leafy shoots from the lower parts of cashew trunks and on cut branch stubs, before the start of the flowering season, can delay the powdery mildew disease of cashew for up to several weeks. These types of shoots grow deep within the shade of the tree canopy sheltered from hot sun and heavy rain, which inhibit powdery mildew. They are the main means by which the disease survives from flowering season to flowering season.

If onset of the disease is delayed, there may be no reason to apply up to five rounds of fungicide as soon as flowers emerge, which is the intended practice of many growers, since there may be no disease at that stage. As a general guide, a grower should prepare to apply fungicide (sulphur dust) when the disease is detected on an average of 10 out of a 100 flowering shoots (panicles). At this level of the disease, there will be time for the grower to make arrangements to dust before the disease (if it continues to develop) has spread so much that it will cause significant decrease in the number of nuts produced.

In summary, in order to derive the most benefit from the inhibitory effect of a hot dry environment on the growth and spread of powdery mildew disease, a grower needs to ensure the trees are well separated, and that shaded shoots and suckers are removed well before the flowering season. During the flowering season, the grower monitors the trees, searching for the presence of the disease on the flowers using an appropriate method. Fungicide is applied when and if disease is detected on more than 10 percent of the flowering shoots. If disease continues to increase, more rounds are applied, but if the actual amount of disease falls and keeps on declining, there is no need to apply further rounds of sulphur.

An Extended Field Experiment in Cashew Disease Management

In April and May 1997, teacher and pupil representatives, school committee chairpersons, and some other committee members from 16 rural primary schools interested in cashew, attended two two-day workshops on alternative cashew disease management. The workshops were organized by Mr M Matola from the Nachingwea District Education Office assisted by Mr Hamisi, crops specialist from the District Agriculture Extension Office, and RIPS.

Reviewing and Questioning

In the first workshop in April the participants, gathered together in a cashew field, reviewed what they knew about cashew cultivation. Questioning was kept very open, with deliberate avoidance by facilitators of introducing the topic of cashew disease. Participants searched in the field for actual examples of the things they said were important or had a bearing on their own cashew cultivation. Initially, many who had mentioned the "mist" as an important problem did not believe that they could find damage caused by it on the spot. April was not the right season for misty weather, which is widely believed to be the cause of flower damage. Finding examples of the disease therefore contributed to the challenging of previously held beliefs about the cause of this disease.

Calendar

A debate developed on what the samples were, their importance, and what was the cause of damage or disease. During the various interpretations that were discussed, as matters of time and season became important in the explanations, participants built a calendar on the ground using actual cashew shoots. The calendar spanned 12 months and showed cashew tree development stages. The various types of damage thought to be important in each month were represented by actual examples of the types of cashew shoots under discussion (eg old leaves, new tender sprouting leaves, young flowers, diseased flowers, young nuts, mature nuts), which the participants agreed were typically found in that month. Cards naming important phenomena and various management practices were also placed appropriately in the calendar. The calendar or model made it much easier for facilitators and participants to discuss past and present events, and future possibilities at the same time. In this way, participants were able to share with each other a wealth of experience built up over time from their own observations as well as the day's discoveries.

Extending Perceptions — the Microscope

This debate led the participants, through information they themselves had presented, to question the explanations they had believed about the cause of the problem they had identified as the most important in their cashew field, namely the "mist" disease. Participants then went on to study the symptoms of "mist" disease, a sort of white powder clearly visible on affected leaves, using a microscope borrowed from the local Ministry of Agriculture Agricultural Research Institute, Naliendele, Mtwara. In groups, the teachers, committee members, and pupils present prepared for themselves the microscope slides. As they took turns to look through the microscope, what they previously had thought to be mere powder on a leaf caused by "mist," revealed itself to have a definite shape and to produce small eggs (spores) that germinated and laid down "roots." It was possible to consider that some "active agent" or pest not unlike other well known living creatures lay behind the damage to cashew flowers. During further discussion, participants rapidly made a link between their existing knowledge on the sorts of places where they had always seen these powder symptoms and with the places where they had found the symptoms earlier that day. It was easy to appreciate that these characteristic sites represent the sorts of places and conditions that favor the pest, i.e., young leaves, flowers, shady sites, sprouts under the deeper shade of the tree — there is less on the sunny side.

Generating New Options

Furnished with new ideas on the nature of the disease and the sorts of places it favors, participants asked themselves how this information could be exploited in their case? Before long, some suggested that it may be possible to stop the pest before the main flowering season. Pruning away the sorts of shoots it has been found on during the workshop, and thinning trees to reduce shade, were among the practical steps mentioned. In day two of the workshop, these ideas were tried out in practice. Participants, with an extension officer, started to prune and thin trees in the cashew field of the host school, helping that school with necessary field preparation at the same time as learning in more detail what sorts of trees and shoots should be removed in their own cashew fields.

A second workshop was organized two weeks after the first (to give participants time to work in their own school cashew fields). In this workshop participants were introduced to a method for weekly monitoring of the amount of powdery mildew disease on the trees. The information was recorded at the schools and was to be used by the school agriculture teachers to determine whether fungicide (sulphur dust) needed to be applied or not according to guidelines given by the facilitators/extension officer.

Reduced Pesticide Use, Direct Learning

After this learning and sharing process, a total of 13 of the 16 schools thinned and pruned their cashew trees before the flowering season These schools went on to try out monitoring throughout the entire flowering season of the actual amounts of disease that developed in their cashew fields and consider the significance of this disease for sulphur dusting. This marks a significant change from previous practice where sulphur dust has been applied without any reference to actual need nor in conjunction with knowledgeable use of other cultural practices. At the end of the first season, seven of these schools achieved a substantial reduction in fungicide use, using on average one-third less sulphur than they otherwise would. Cashew production costs were correspondingly lowered. At other schools, where confidence in the new approach wavered and sulphur dust was applied based on calendar dates rather than monitoring, news of the successes from those who did reduce sulphur use is increasing resolve to try the system again next season.

Schools Evaluate the Experiment

In late November 1997, after the harvest, an evaluation of the season's results was organized by the District Education Office, hosted by two of the rural primary schools, and attended by representatives of 16 schools. They listened to presentations from schools that had successfully tried out the new approach, met in groups to compare and discuss their own results, and to debate what to do to improve the situation next season. Participants considered this sharing of experiences to be extremely valuable — representatives from schools that had reverted to calendar spraying, although they had taken data, which showed very low powdery mildew levels, were encouraged by the accounts from fellow teachers. Ado Tamba, agriculture teacher Songambele Primary School, gave a very detailed presentation of the season's events in his school cashew field. His account shows how direct experimental action contributed to learning. It illustrates several of the sorts of issues that arise in connection with integrated pest management as opposed to the apparent comfort and security of the calendar spraying approach.

Cooperation and New Skills

The extended field experiment effectively brought together school teachers and a senior agriculture extension officer in an open-ended learning process. Important opportunities and insights have emerged. The local agriculture extension service has gained hands-on experience of alternative ways of working with rural communities through the medium of extended learning experiments. In this, learners, farmers, and extension alike, become interested in trying out new possibilities against the background of their existing knowledge and build on this rather than ignore it. The approach is being perpetuated by the District Extension office, and there are plans to link training of agriculture extension officers in cashew management with the schools so that officers benefit from the practical experience of the school teachers.

Teachers charged with the task of generating income from school cashew production have made significant discoveries, which reduce their dependence on expensive fungicide. This has been done through their own prolonged observations in their own cashew fields. Their attention has been focussed on the importance of local knowledge and information and one's own action in achieving economic progress. These same teachers may be more receptive to the idea that other agriculture projects at their schools can also benefit from local knowledge.

Greater Involvement for Pupils

In 1997, it was generally acknowledged at the schools' own evaluation meeting that pupils had not been adequately involved in conducting all aspects of the cashew management. Rather, despite the efforts of teachers, they were mainly observers or a work force. But, genuine active involvement can develop cooperation, planning and management skills, and stimulate pupils' natural interest in enquiry through their own efforts to search for knowledge. Being responsible for calculations and for mapping out the course of disease encourages a lively interest in the practical potential of standard school topics such as biology and mathematics. Parents will have a natural and genuine interest in the accounts of pupils who are actively participating in cashew production in this way in their schools — the key technical issues are the same as those faced by the parents in their own farming endeavors. In addition, parents have a wealth of other experience and insight to contribute. Schools should now be seeking ways to encourage parents to share their knowledge on several topics of direct relevance to making a living from cashew. This will promote a more conscious appreciation, reflected in the schools classes, of the interrelatedness of cashew production with, to name a few, income, generational conflicts and land/tree ownership issues, the importance of seeking cooperation for effective cashew sanitation over large areas, and the necessity for more equitable sharing of cashew revenue from village taxes.

There is considerable interest in addressing the first problem of inadequate pupil involvement. One idea is that agriculture teachers backed by head teachers make the work the responsibility of the pupils, i.e., their own projects where they plan, conduct, calculate, and report on the season's activities. This type of thinking is supported by Work Studies. This is a new development by the GOT Ministry of Education to formally introduce action-based learning processes into primary education. This is seen as a major initiative to improve the learning experience and help schools offer educational opportunities which correspond better to local resources and opportunities. In Nachingwea, District education authorities are enthusiastic about the cashew experiment and have requested that the topic and approach used be added to the Work Studies curriculum. The setting up of active school committees represents a way towards far greater involvement of parents in all forms of school activities.

Lessons/Conclusions

As is being shown through the cashew work, the village school can be a vital and natural setting for the integration of a range of interests, skills and competencies (agricultural, planning, business, etc.), provided and generated by pupils, teachers and parents/villager,s and other service institutions such as extension. Rural communities are being asked to play a major role in school rehabilitation. This requires a reorientation of institutional rural education goals so they are more viable for parents, teachers and students. That education should equip pupils for life and work is fundamental. In the cashew example, the emphasis was changed from getting a certain standard technology right (dust sulphur five times) so that it could be transferred, to promoting a learning process through which the capacity of people to cope in a ever changing and unpredictable world is increased. Donor-supported programs such as RIPS can use their facilitation skills, credibility and flexibility in searching for and encouraging linking up of sources of skills and knowledge across discipline, sectoral, and community barriers. There is a great need for education policy to give prominence and value to the knowledge of skilled local farmers and artisans and to ensure teaching styles involve students in direct learning through action. Drawing this knowledge and approach back into the school agriculture and general education practice can form a dynamic bridge between local and valid knowledge and insights from Western research. It opens up the potential for fruitful new locally adapted agricultural and other practical innovations and parent-pupil-teacher understanding and collaboration, which grow from and with the existing and evolving social-political setting.

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International Centre for Insect Physiology and Ecology (ICIPE)

Utilizing Emerging Information Technologies to Improve Communication and Meet the IPM Information Needs of Forestry/Agroforestry Practitioners in Africa

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Situation

We realize that many Africans do not have reliable, or in many cases any direct access to the World Wide Web (WWW). We also realize that there is severe environmental degradation, deforestation, and economic stress that are caused, in part, by population pressures. There is, in general, inadequate management of forest and agroforest resources and a relatively poor understanding of the complex issues dealing with management of these forest resources, particularly with respect to the impact, or potential impact, of both indigenous and introduced pests. Integrated pest management (IPM) holds great promise in assisting Africans to manage these forest/agroforest resources. IPM is a knowledge-rich system. Farmers and managers, and those that support them, must have ready and reliable access to quality information on a timely basis. Additionally, timely and reliable communications among and between practitioners, intermediaries, and users are paramount in importance for effective IPM implementation (Muhoho 1991, Odhiambo 1991).

We believe that existing and evolving electronic technologies, including the World Wide Web (WWW), can be effectively used to assist in implementing the concepts and practice of IPM in forest and agroforestry systems in Africa. Individual IPM practitioners, intermediaries, and/or users do not necessarily require direct access to the WWW to use WWW-delivered materials. Selected/desired materials can be acquired by a colleague, duplicated, and provided to users without direct Web access as printed or electronic documents.

Implementation of alternative, unfamiliar, and new technologies, such as IPM, can be facilitated when individuals involved in producing and managing trees have a clear understanding of the production system and possible ecosystem stresses, including insects and disease organisms, in which the trees and shrubs are grown. Not only is it imperative that insects and disease organism and their impacts be correctly identified, but that their potential impact on hosts an other aspects of the ecosystem be understood as well. We also believe that WWW-delivered materials provides an opportunity to include quality, color pictures that can help practitioners and managers to correctly identify organisms and make appropriate management decisions. Of paramount importance when acquiring and delivering IPM information, is to insure that only credible, accurate, and well-referenced information is made available to users. The quality control issue is an extremely important one that is very time consuming and difficult to implement and maintain.

Proposed Action

We propose to assist in the development and implementation of a framework that will further the evolution and implementation of forest and agroforestry IPM in eastern and southern Africa. We propose to build, in concert with the existing forest IPM activity groups such as the Tree Pest Management Network and the Centre of Forest Health, this framework with the objectives of: (1) improving communications among and between

members/practitioners, (2) providing a focal point for communication of IPM activities through delivery and access to appropriate information, (3) coordinating the development of specific (but brief) IPM materials that include quality pictures, and (4) utilizing evolving electronic technologies to implement and/or deliver these materials and services to African IPM practitioners, intermediaries, and users.

Background

The Need For Food and Fiber

Deforestation, soil fertility depletion, poor management practices, and forest pests seriously affect the capacity of the land to produce forest and agricultural products needed by the rapidly expanding African population. Currently more than 90 percent of the domestic energy use in East Africa is from wood provided by industrial/commercial forests and agroforestry plantings. Without the food and wood provided by agroforestry and industrial/commercial plantations, the human needs for food and fiber would further stress the already severely stressed indigenous forests, further threatening environmental quality, water quality, biodiversity, wildlife, and human habitation (Weiss 1991).

Agroforestry is a collective name for land use systems and technologies in which woody and other perennials (trees, shrubs, palms, bamboos, etc.) are deliberately combined on the same land management unit with herbaceous crops and/or animals, either in some form of spatial arrangement or temporal sequence. In agroforestry systems, there are both ecological and economic interactions among the different components (Mulofwa 1994).

Pest Impact

For many years, the forests in Africa were not seriously affected by damaging pests. However, in recent years severe losses have been caused by the accidental introduction of exotic pests such as the cypress aphid, *Cinara cupressi* (Buckton); the black pine aphid, *C. cronartii* Tissot and Pepper; the pine woolly aphid, *Pineus boerneri* Annand; and the leucaena psyllid, *Heterosophylla cubana*. When these insect pests arrived, their impact was especially severe due to the absence of natural enemies and the weakened condition of their host trees caused by drought and poor forest management practices. Both forest plantations and agroforestry plantings have been devastated in some areas (Ciesla 1994, Murphy 1997).

Integrated Pest Management (IPM) in the forest context can be defined as the maintenance of destructive agents, including insects, at tolerable levels by the planned use of a variety of preventive, suppressive, or regulatory tactics and strategies that are ecologically and economically efficient and socially acceptable. It is implicit that the actions taken are fully integrated into the total resource management process — in both planning and operation. Pest management, therefore, must be geared to the life span of the tree crop as a minimum, and to a longer time span where the resource planning horizon requires (Waters 1974). Integrated pest management (IPM) is an interdisciplinary approach to reducing crop losses through the use, by farmers, or optimum mixes of pest control techniques. It combines the aims of agricultural productivity, environmental sustainability, and cost effectiveness (IPMForum, 1998). With its emphasis on making the best use of local and human resources, IPM encourages, wherever appropriate, the use of natural control mechanisms (for instance pest predators, parasites, resistant germplasm) and "traditional" pest management techniques used by farmers (Weiss 1991) .

Application of IPM tactics to reduce the impact of forest pests requires considerable information, which has not been available in Africa. The need for increased information and communication on IPM throughout Africa has been documented in several workshops and conferences held during the 90s (Anonymous 1997, Murphy 1997). Additionally, workshops and conferences such as The International Consultative Meeting of Forestry Directors and Policy Makers held in Kenya in 1995 (Allard, Murphy, Ciesla and Mbagathi 1995) and the 1996 meeting in which the Tree Pest Management Network for Central, Eastern and Southern Africa was formed (Anonymous 1997, Allard and Odera 1994) have emphasized the need for regional cooperation in training, research, quarantine services, and exchange of technical expertise and information.

IPM Implementation Impediments

Application of information technologies can reduce the limitations to implementing IPM in eastern and southern Africa that results from:

- lack of communication and coordination between professionals and intermediaries both within and between countries;
- limited availability of quality, synoptic information about forestry, forest insects and diseases, and forest practices specific to eastern and southern Africa;
- fragmentation of and difficulty in obtaining the forest IPM resources that are available;
- the inability to obtain and modify the available information to suit the needs of practitioners and users;
- the lack of quality images (pictures) relating to these forest issues for use in illustrating IPM materials. This is particularly true for insects and disease organisms [Quality pictures are, in our opinion, extremely important additions to educational materials to insure that correct identifications are made and that appropriate management tactics are implemented (Douce, et. al 1997).];
- timely acquisition of printed materials is often limited by: costs, physical availability, and distribution issues;
- limited ability to locate, distribute, and deliver needed information to educators, intermediaries, and users on a timely basis; and the lack of funding to implement information, communication, and coordination of IPM activities.

Bugwood — Africa World Wide Web Site

This web site was constructed as a demonstration site for viewing by attendees at the African Integrated Pest Management Communications Workshop in Nairobi, Kenya on March 1-6, 1998. This site is being designed and proposed by personnel associated with The Entomology and Forest Resources Digital Information Work Group at The University of Georgia, College of Agricultural and Environmental Sciences, Tifton, Georgia (USA) in cooperation with Forest Health Protection Units of the USDA Forest Service and the Forest Health Centre, Nairobi, Kenya. **Bugwood - Africa** will be a sister site of the **Bugwood - USA** site: ***http://www.bugwood.caes.uga.edu/***

The site visually demonstrates what we view as possible applications of existing and evolving electronic technologies to improve communications, and support implementation and utilization of Integrated Pest Management in agroforestry and forestry in eastern and southern Africa.

Bugwood -- Africa is partitioned into several sections to address some of the impediments to forest/agroforestry IPM implementation identified above.

In the **Newsboard** section, we propose to develop and implement a WWW-based newsboard/information exchange system to provide posting of communications and responses by registered members.

In the **Fact Sheet** section, we intend to provide a consolidated set of concise, factual information summaries dealing with insects, diseases, host selection, and other aspects of forest management appropriate to the areas of concern. We propose to compile these fact sheets by developing partnerships with agencies that have already developed and published these information sheets. However, it will be necessary to write/develop new ones as well. We intend to modify the format and layouts of, and implement the existing fact sheets to be consistent in format and to include citable references. Additionally, we feel that it is imperative that quality, color pictures must be incorporated into the fact sheets in addition to the line drawings contained in some of them to enhance the information content and utility of these sheets for identification purposes. Notice that we provide fact sheets in dual formats, one for on-screen viewing in hypertext markup language (HTML) and one version for quality printing as Adobe Acrobat (PDF) files. Additionally, we feel that it is important that, when appropriate and possible, to provide multiple language versions of the fact sheets (currently, English, French, and Swahili). Currently, we have loaded a few example sheets following this format.

In the **Reference** section we currently outline:

- a glossary containing the definitions and terminology used throughout this site and in common use in forestry and agroforestry across Africa;
- selected publications and reports appropriate to IPM implementation in Africa; and
- a listing of ongoing or recently completed forest/agroforestry IPM projects in Africa.

When implemented, this section will also contain detailed definitions of IPM in the context of African forestry and agroforestry, as well as descriptions of the methodology and techniques that can be used (predators, parasites, resistant germplasm, timing, cultural, etc.).

The **Contact** section will contain information about:

- **Bugwood -- Africa** Principal Contacts;
- a listing of IPM Service Providers such as identification and library services, training materials, workshops, and material and equipment supplier addresses and contact information;
- contact information for international, regional, and consulting services that are multinational in scope; and
- a country-by-country governmental organizational contact list of forest IPM information and service providers.

The **Links** section will, like many other sites, contain a listing of what we feel are appropriate and complementary links to other World Wide Web sites. These links will contain sites specific to IPM, forestry as well as demographics, communications, etc. as both references and starting points for more research.

Future

Other aspects of information technology that we would like to implement are:

- a database containing a range of uses and characteristics of the many tree and shrub species available that would be searchable by usage, environmental constraints, etc.;
- either link to or duplicate ecotype, rainfall, and other maps of interest that could be used in conjunction to the searchable database listed above;
- a database that would allow users to lookup and obtain alternate names for the insect, disease, tree, or shrub species of interest (e.g. scientific names to local or alternate names used for the species of interest);
- an image database system for locating, documenting, and accessing archived, high-quality images that will be maintained in The Entomology and Forest Resources Digital Information Work Group archives. This would allow for not only documentation and identification of the images, but also access to them for use in a large variety of potential applications;
- for computer users without on-line Web access, the development and packaging of **Bugwood -- Africa** as an off-line browser; and use of other digital information technologies such as video presentations that can be delivered over the WWW or by CD-ROM.

Background Information Available on the World Wide Web

Listed below are a few WWW sites that we found to provide useful information about several topics that we discussed in this presentation. We recognize that these are by no means comprehensive, but we thought that you might find them useful.

Overview of information on Integrated Pest Management (All of these sites have extensive IPM WWW links: See those links for more sites)

- IPMEurope, the European Group for Integrated Pest Management: *http://www.nri.org/IPMEurope/homepage.htm*
- IPMForum, Consultative Group for International Agricultural Research (CGIAR): *http://www.nri.org:80/IPMForum/index.htm*
- Consortium for International Crop Protection: *http://ipmwww.ncsu.edu/cicp/cicp.html*
- National Integrated Pest Management Network (NIPMN): http://ipmwww.ncsu.edu/cipm/
- USAID's AfricaLink: *http://www.info.usaid.gov/regions/afr/alnk/*
- Africa IPM Link: http://ipm-www.ento.vt.edu:8000/ail/
- CAB INTERNATIONAL (CABI): http://www.cabi.org/aboutcab/aboutcab.htm

Overview of information about Forestry and Agroforestry

- USDA Forest Service: *http://www.fs.fed.us/*
- USDA Forest Service, Forest Health Protection (FHP), Southern Region: *http://www.emapfhm.gov/fhp/hosf/hosfhome.htm*
- Extension Forest Resources, The University of Georgia (USA): *http://www.forestry.uga.edu/*
- The Food and Agriculture Organization (FAO) forestry homepage: *http://www.fao.org/WAICENT/FAOINFO/FORESTRY/forestry.htm*
- Forests, Trees & People Programme in Anglophone Africa: *http://www-trees.slu.se/fan/eaftp.htm*
- The International Centre for Research in Agroforestry (ICRAF): http://www.cgiar.org/icraf/

Information about the electronic communications infrastructure status and developmental activities.

- USAID Leland Initiative: Africa GII Gateway: *http://www.info.usaid.gov/regions/afr/leland/*
- Morocco Trade and Development Services, S.A. Assisting in implementation of Leland Initiative in Africa: *http://www3.mtds.com/english/consult/leland/inprogress.html*
- African Connectivity, Problems, Solutions and Actions: *http://www.nsrc.org/AFRICA/africa.html*
- International effort to empower sub-Saharan African communities with information and communication technologies: *http://www.idrc.ca/acacia/acacia_e.htm*
- African countries internet connectivity - map: *http://demiurge.wn.apc.org:80/africa/afrmain.gif*
- International E-mail accessibility - Africa: *http://www.ee.ic.ac.uk/misc/bymap/africa.html*

For a wide range of information about Africa, visit:

- **Africa Online:** *http://www.africaonline.com/*

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International Centre for Insect Physiology and Ecology (ICIPE)

A Case Study of the USAID Leland Pilot Activity: Developing and Using Electronic Market Information in Eastern and Southern Africa

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Background

The rapid spread of information technology has led to a hyper-competitive global economy where access to information resources are becoming more important than company size or geographic location. Critical market information, identification, and qualification of prospective trade partners, shipping arrangements, and other point-to-point business transactions can now be conducted on-line for a fraction of the time and cost traditionally associated with these international transactions. In this new electronic marketplace, the importance of building institutional and human capacity in the effective use of this information technology cannot be understated—particularly for many small- and medium-scale enterprises (SMEs) in developing countries of Africa.

With approximately 75 percent of its population employed in farm-related activities, information technology in Africa's agribusiness sector is pivotal to economic growth. However, of the 26 agribusiness associations in attendance at the 1996 Southern African Regional Agribusiness Forum in Harare, Zimbabwe, none reported using their e-mail or other information technology networks. Lack of experience in use of information technology among agribusinesses and agribusiness associations emerged at the Forum as the primary constraint to: (1) accessing market information, (2) improving regional trade and market access, (3) monitoring regional trade and administrative policy barriers, and (4) incorporating telematics into the everyday operations of SMEs.

Furthermore, information collection and dissemination, especially on a regional basis, is woefully absent in the myriad market centers throughout Africa. In this context, recent improvements in the policy environments will prove economically fruitless unless the information flows are enhanced on the continent. This lack of freely accessible market data, complicated by poor communications, has stifled Africa's entrepreneurial prowess in regional and global markets.

A brief summary of these and other related electronic networking problems and impediments confronting African agribusinesses are provided below.

Summary of Main Problems or Impediments

- Lack of a legal system to support market driven contractual arrangements that encourage information sharing.
- Lack of national and region-wide telecommunication infrastructures capable of providing full Internet access.
- Lack of electronic and local area networks in many of the regionís agribusiness associations.
- Lack of technical experts and trainers at the local level to provide support and education to both technical staff and end-users.
- Lack of regional information and databases.
- Lack of quick, reliable and inexpensive access to global information and databases.
  Lack of awareness of how information technology can be utilized in daily business practices to positively impact the "bottom line."

USAID Leland Pilot Activity

To address this dual need for human capacity development and creation of regional information resources, the USAID Leland Initiative, focused on integrating Internet in 20 African countries over a five year period, funded a pilot information technology activity for African agribusiness associations. The pilot Leland activity falls under the direction of the USAID AFR/SD/PSGE/Private Sector Unit, with technical assistance from the Agribusiness and Marketing Improvement Strategies (AMIS-II) Project and Computer Frontiers, Inc., an information technology contractor. The overall purpose of the AMIS-II project is to promote and strengthen agribusinesses that contribute to the efficient marketing of agribusiness products. The Leland pilot activity seeks to demonstrate how electronic networking and access to critical market information can be incorporated into marketing strategies and everyday business practices--even where full-Internet access is not available.

Methodology

To achieve its intended target results, tasks for the Leland pilot activity were designed as two separate, but inter-related phases. The first phase, initiated in November, laid the groundwork for using the Internet in management, quality control, and implementation of agribusiness activities. The second phase focuses on working with and strengthening two Apex groups who, in turn, would facilitate regional networking efforts and information sharing among agribusiness associations. A summary overview of this two-phased methodological approach is provided below:

Summary Overview of the Pilot Leland Activity Methodology

Phase I

- Identify which associations and groups to work with, and forge these organizations into an informal network of regional agribusiness associations.
- Use existing technology, telecommunication infrastructur,e and Internet access.
- Build sustainable, human capacity through training and education.
- Reinforce human capacity development through ongoing mentoring and follow-up, on-site technical support visits.
- Facilitate information flows and identify what types of information are most useful to the region's agribusiness associations.

Phase II

- Identify two Apex organizations charged with formalizing and coordinating regional agribusiness associations linkages.
- Assist Apex organizations in developing customer service plans for providing customized information services to its members and end-users.
- Provide support and maintain regular contact with Apex staff, anticipating their information needs in developing local market information collection and dissemination systems.
- Provide technical advice on equipment and software systems located in the Apex organizations.

More specifically, the first phase sought to achieve three primary goals: (1) transfer human capacity skills to a broad base of local agriculture and business associations throughout the region, (2) identify regional information needs and facilitate access to critical market information, and (3) identify local agribusiness associations with a pre-existing management organization structure and basic information technology capabilities sufficient to sustain the ongoing efforts of the Leland pilot activity.

Working closely with agricultural and private sector officers in AFR/SD/PSGE and regional USAID missions, a list of leading agribusiness, trade and professional associations, as well as agricultural research centers were initially identified. These local entities were then invited to send

representatives to a series of regional workshops sponsored by AFR/SD/PSGE, with technical assistance from the AMIS-II Project, Human Resource Development Project (HRDA), and Computer Frontiers, Inc. The workshops were intended to upgrade the capabilities of agribusiness trade associations to use information technology more effectively. Participants in these workshops received practical, hands-on training in how to use the Internet, e-mail, and other information technologies to conduct their daily business communication, develop professional contacts with other agribusiness colleagues, access critical market information, identify trade leads, and electronically market their products. Judged by the evaluations participants turned in at the end of each session, the workshops were an overwhelming success.

In order to support these agribusiness associations and individual training participants in getting up-to-speed in their newly acquired information technology skills, an electronic market information specialist with the AMIS-II Project provided dedicated assistance and mentoring via e-mail. Immediately following each workshop or training event, the information specialist, located in the United States, established e-mail contact with the agribusiness associations and individual training participants, forging an informal communication network. The information specialist also responded to requests from the various participants for technical advise and assistance in accessing information resources. Great care and attention was given to enabling these agribusiness associations to access global and regional market information on their own. Where necessary, the information specialist identified and transferred pertinent market information to help expedite information flows into the region. Through these e-mail contacts, the information specialist tracked the progress of the various agribusiness associations in their effort to incorporate information technology into their daily business practices.

At the one year mark of the Leland pilot project, consultants from Computer Frontiers, Inc. and the AMIS-II project were sent to Madagascar, South Africa, Zambia, and Zimbabwe to explore how the Internet is now being used at the organization who had been trained in one of the Internet for Agribusiness training conferences. The consultants surveyed Internet use, and conducted follow-on Internet training activities with these groups.

Under phase II of the methodological approach, two apex groups will be identified and charged with coordinating agribusiness association linkages in the Southern and Eastern Africa regions. These organizations should minimally have a local area network administrator, electronic mail capacity, and an ability to collect and disseminate market information to their audience. The Leland pilot activity would help assess the information technology and telematic infrastructure in the Apex organizations and collaboratively determine how best to strengthen, if needed, this organization (e.g. hardware or other equipment, software, training, interface with service provider). Emphasis would also be placed on the development of customer service plans that will permit the Apex organization to provide general as well as well as customized information products and services to its membership an other end users. Whereas these information services would be free on a trial basis, a fee schedule is to be established to cover costs for information collection, processing, packaging, and dissemination.

Summary of Key Accomplishments

The first phase of the Pilot Leland Project is currently drawing to a close. During this initial phase, four major accomplishments were achieved: (1) an informal network of regional agribusiness associations was developed, (2) a preliminary assessment of the regionís electronic market information needs was established, (3) local agribusiness association staff received practical, hands-on training in marketing and daily business uses of Internet-related technologies, and (4) two prospective APEX organizations were identified. Together, these accomplishments provide a solid foundation for the next step in the Pilot Leland Project—the start-up phase of the APEX organizations and formalization of regional agribusiness associations linkages. A brief summary of the key results, to date, is highlighted below.

Electronic Networking

Identified and created a broad, informal network of approximately 80 agribusiness-oriented trade and professional associations, businesses, and education institutions in Eastern and Southern Africa. This network utilizes the various associationsí existing e-mail capabilities and is currently maintained through informal human networking channels, and simple e-mail communication and announcement of ongoing activities.

Established and maintained a listserv or electronic discussion forum, called AGNET-AFRICA, to encourage networking and information sharing among agribusiness and professional associations in Eastern and Southern Africa.

Facilitation of Information Flows

Completed 215 information requests from Agribusiness organizations in 10 countries over an eight month period from March - October 1997. Countries included Botswana, Kenya, Malawi, Madagascar, Mozambique, Namibia, South Africa, Uganda, Zambia, and Zimbabwe. A detailed breakdown of the total information requests reveals that the majority of information requests (47%) were from agribusiness organizations in Zambia and Zimbabwe.

An assessment of the type of information requested reveals that regional (25%) and market (16%) information flows were in the greatest demand. A further breakdown of the regional information flows reveals that over half (57%) involved market information. In short, access to both global and regional market information was critical to the agribusiness associations. (Regional information denotes news and other information specifically pertaining to countries and regions in Africa. Market information includes market surveys, country and industry profiles, trade trends, export and import data, and commodity production and consumption.)

Marketing Promotion

Inspired by workshops, training sessions, and on-site consultations provided through the SD/PSGE Pilot Leland Project, several agribusiness organizations have taken steps to use information technology to market and promote their products and services. To date, three organizations created their own marketing web page; several more associations are actively considering development of a marketing web page; and two organizations with existing web pages are making efforts to update and maximize the effective impact of their web sites.

Human Capacity Development

Trained approximately 150 participants attending three conference workshops and four on-site training sessions sponsored by AFR/SD/PSGE. A list of conference and training events is provided below.

Conference Workshops and Training Sessions Sponsored by USAID, AFR/SD/PSGE

1. Information Technology Agribusiness Workshop, Lusaka, Zambia, December 1996
2. Business Development Training of Trainers Workshop, Lilongwe, Malawi, February 1997
3. Information Technology Agribusiness Training, Antananarivo, Madagascar, October 1997
4. Training for prospective APEX organization, Durban, South Africa, October 1997
5. Internet Training for Agribusiness Associations, Harare, Zimbabwe, October 1997
6. Internet and Information Resources Training for Agribusiness Associations, Lusaka, Zambia, November 1997
7. Internet and Information Resources Training for Business Associations, Lusaka, Zambia, November 1997
8. Developed Internet training material which utilizes an integrated, adult-learning approach to teach (a) technical skill development, (b) human networking techniques, (c) applied substantive research skills, (d) practical business examples and applications, and (e) a critical survey of selected information resources available through the Internet.
9. Identified and trained two technical staff from local agribusiness associations in Malawi, and utilized their acquired training skills to teach other African colleagues at a regional information technology workshop sponsored by AFR/SD/PSGE
10. Provided on-site, follow-up consultations to approximately 15 selected agribusiness associations in South Africa, Zambia and Zimbabwe. Consultations focused on the effective utilization of information technology for market promotion and daily business practices.

Conclusions and Lessons Learned

Overall, the first phase of the Leland pilot activity has been an unqualified success. A broad base of the region's agribusiness associations have received information technology training and are actively applying this knowledge in their daily business practices. Many of these agribusiness associations now use the Internet to keep abreast of changing trends in the agribusiness industry, identify trade leads and prospective business partners, and market their products to a global audience. In addition, the Leland pilot activity has also yielded several important lessons learned. A few of these lessons are briefly described below.

First, forging and maintaining a viable, interactive electronic network takes a considerable amount of time and attention. Once an electronic network has been established, it must be actively maintained and constantly evolving to meet the changing needs of network participants. This often involves both regular and pro-active communication exchanges, and active solicitation and discernment of participant information needs.

Second, it was found that if Internet is available in an institution, but there is no effort to provide desktop level access to the resource, the Internet is not well used by an organization overall. The lack of Local Area Networks (LANs) is a major inhibitor of desktop access in these organizations. The focus for USAID, when assisting in building Internet capacity in an institution, must include an emphasis on LANs and providing technical assistance, and simple equipment to make internal organizational networks possible.

Third, training must focus on involving the highest managerial level of these institutions, either before or in tandem with training other staff. We found that where lower level staff members were trained without the involvement of managers, there was little use of Internet in that organization.

Fourth, follow-up support and ongoing mentoring were critical success factors in the effort to increase human capacity development. Workshop and training participants who received immediate and sustained follow-up support were more likely to apply their newly acquired information technology skills in solving typical business problems confronted on a daily basis.

Fifth, human networking skills and reticence to participate in information exchanges remains one of the greatest obstacles in creating and maintaining an electronic network in the Southern and Eastern Africa region. Information technology provides the tools to make electronic networking technically possible; but human interaction and a willingness to share information provides the substance of electronic networking. In other words, for an electronic network to be successful, people must first be taught how to share information! Teaching the benefits and skills of human networking is particularly important in Africa. Across much of the African continent, both historical experience and lack of national legal systems supporting freedom of speech have led to a cultural ethos which discourages written forms of information exchanges typically found in electronic networking forums such as the Internet.

Sixth, from the assessment of requested information flows previously noted in this case study, access to regional market information is of utmost importance to agribusiness associations in Southern and East Africa. Yet, the profound dearth of indigenous market information is readily apparent, especially in public information forums such as the Internet. Information as a product is a new concept in Africa and regional databases, for the most part, are non-existent. The demand is there but the supply is not! To create these needed information resources, market information must first be collected on a local and regional basis and stored in a readily retrievable format for access by end-users. Phase II of the Leland pilot activity will focus on assisting local agribusiness associations develop their own information collection and dissemination strategies.

Finally, given the expensive and unreliable Internet connections in many of the Southern and East African countries, access to information is often prohibitive for local agribusiness associations. Consequently, the research and information support services provided under the Leland pilot project proved to be an extremely valuable commodity to these agribusiness associations. Until the regionís telecommunication infrastructure, policy environment and pricing situation improves, there will continue to be a sustained need to assist and expedite information flows into Africa.

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International Centre for Insect Physiology and Ecology (ICIPE)

Information Needs on Integrated Production and Pest Management Programs

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"IPPM is not for farmers, it is by farmers."

The Zimbabwe Integrated Production and Pest Management (IPPM) Program has been operational since last year with Training of Trainers (TOT) and Field School Training on cotton-based cropping systems (cotton, maize, groundnut, and paprika). This experience has provided insights on the information needs of IPPM program from the farmer's field to the policy maker's desk. These information needs, and potential applications of information technology are discussed based on this experience. Finally, a pilot test case for testing the impact of information technologies in IPPM extension field projects is proposed at a cost of about US$50,000 for full participation of all program staff involved in the project.

Introduction

Zimbabwe has had a long history of IPM research and implementation on various crops, especially on cotton, and maize. However, these efforts have not been widely available to communal, resettlement, or small scale farmers that make up the majority of the farm population and produce the majority of the crops in the country. A major limitation has been insufficient funding and technically competent field staff able to provide farmer education on IPM. At present, farmers are suffering from poor crops, high inputs and costs, and unstable market prices even though research results are available to improve management of the crop.

A new program, Zimbabwe Integrated Production and Pest Management Program (IPPM), which is jointly funded under the Government of Zimbabwe and a FAO Technical Cooperation Program (TCP/ZIM/6712), began in 1997 and aims to provide education programs to farmers in communal and resettlement areas of Zimbabwe. At the current stage of the program, 21 staff are being trained in a season-long Training of Trainers program, which focuses on cotton, maize, groundnut, and paprika production and pest management. One-hundred-fifty farmers in five field schools are also participating in the training providing a pilot level test of this new field school extension methodology.

The Training of Trainers and Field School programs have provided useful insights into the information needs of IPM programs and practitioners in the field. These needs and opportunities are given below.

Information Needs

IPPM programs typically involve several levels of participants and their respective information needs. At the forefront are the farmers for which programs are established. Next are the field trainers that facilitate field schools and the field supervisors that support and supervise these trainers.

Further up the bureaucratic ladder within both government and non-government organizations are policy makers, researchers, and extension staff that contribute in some ways to the support or supervision of field staff. Project secretariats are included here. There are lateral relationships such as the media, which provide support and information through printed or broadcast means, and companies, which also naturally provide biased information designed to sell their products. Finally, there are academic institutions, which provide various formal and informal expert support to all levels of programs. Each group has its own information needs and relationship with other players with their own information flow needs.

In IPPM programs in which field level facilitators are working directly with farmers, we have found that the following information is required:

- Graphics to assist in identification of diseases, weeds, pest insects, and natural enemies. These graphics should be associated with some basic bionomic information including ecological data.
- Management practices and their researched basis on such topics as resistant varieties, soil fertility management, soil conservation, green manure species and their seed sources, seed banks, water conservation, exotic natural enemies for exotic pests, biopesticides and their sources, organic agriculture, pheromones, etc. This information helps to expand the range of options farmer groups can test for solving specific local problems and helps field staff to improve their basic knowledge. Simple messages do not help extension staff who have farmers asking them complex questions.
- Answers to inquiries from the field. It is the long-term wish of every field staff to have instant access to information and technology to respond to inquiries from farmers or to new problems faced in the field. Examples that have actually been seen this season in the TOT include "What is the yield loss due to early aphid infestation?," "What is the fast-walking-mealy-bug-looking aphid predator we found all over the early cotton plant?," and "What are main bollworm predators?" These questions were actually answered through email from various sources such as the International Institute for Biological Control (IIBC), University of California, and the Food and Agriculture Organization of the United Nations (FAO), as well as through face to face consultation with national experts at the Zimbabwe Cotton Research Institute, which fortunately is next door to the training center.
- Exchanging experiences on all kinds of topics is essential for field staff. Icebreakers, energizers, field training activities, field training studies, management solutions, field solutions, etc. are all types of information and experiences exchanged when field trainers get together with each other and with researchers.
- Project management methods are also of interest to field staff striving to get the most field impact out of their usually very limited budgets. Any new ideas on managing field activities, effective training and advising and community organizing communicating with the project secretariat, etc. are always useful for field trainers.

For project management staff, management of information from and to the field is essential, often on a daily basis. Such information includes:

- Work plans and budgets for field activities. In the non-top down system of this project, it is common to have work plans and budgets to be sent back and forth in an interactive process that ends in outputs that meet project constraints but match field needs.
- Reporting from and to the field is a regular need of all institutions, and especially in this project which includes several branches of the Ministry, FAO Headquarters, FAO regional offices, and interested individuals.
- Responses to logistic requests from and to the field are important especially to keep programs running. Training material requests, travel payments and authorizations, and meeting announcements have been common logistical issues which require regular information flow.

In order to strengthen the capacity of the IPPM programs to respond to these information needs, we have built in computer literacy to the basic IPPM training of trainers. Our goal is to improve the quantity and quality of information flow at all levels of the IPPM project.

Improved Information Flow

During the Training of Trainers course, all participants are receiving hands-on computer instruction on windows, word processing, spreadsheets, email, and world wide web. At the beginning of the project it was expected that the trainers would eventually be managing provincial programs and would need computer skills to prepare local project documents, reports, and statistics. It is hoped that they will also have access to email and the world wide web with time. The great distances between extension staff means that information flow is greatly limited by budgets to travel between sites or to meetings. Also the difficulty of accessing libraries, universities, research stations, NGO, commercial vendors and other sources of information is restricted to those nearby, which are few. If these IPPM trainers had access to email and the Internet, it is expected that information flow would be more frequent, flexible, and would result in much greater interactions with colleagues and various information and technologies providers. The mechanisms that could be used include:

- Chatting for brain storming, and group meetings over the computer.
- Broadcasting e-mails to experts for inquiries, problem solving, and experience exchange.
- Discussion group development that would provide access to both national and international interactions to all members of the discussion groups.
- Data and paper publishing without costly printing charges - especially for farmer and local extension developed technologies and innovations.
- Web-mining for information on IPPM related (and un-related sites) would provide much of the basic graphic and biological information sought.
- Web-page publishing by local projects so that field programs and research institutions can begin to develop meaningful partnerships.

We hope these methods of improved information flow will result in improving the quality of farmer training impact in the field and the overall impact of the project within the Ministry. Some of the expected results include:

- Cross-checking of information (and mis-information).
- Team building through more frequent interaction.
- Quick problem solving from national and international source and experts.
- Better coordination of meetings, and field activities.

- Rapid dissemination of indigenous knowledge and skills (such as application of lime in groundnut fields being tested in Zambia and quickly there after in Zimbabwe).
- Broadcasting of informal observations leading to new researchable areas.

It is expected that the current group of trainees will be the first Zimbabwean extension staff with 21st century IPPM and computer skills and access to international flows of information, and will be key to improved food security, and farmer profitability in Africa.

Conclusion

As the IPPM program moves ahead to help farmers learn about IPPM, the program also needs to provide new methods for access to information to extension staff. These trainers are often isolated by the vast distances of the African countryside. Email and Internet access over phone lines is perhaps the best cost effective way to provide information support. However, certain aspects of our optimism are tempered by the lack of computers in extension offices today. It is our hope that within the time frame of this project, each extension officer will have access to a computer, printer, modem, and email account. This group of officers could be the first in Zimbabwean history to have computer literacy, and the first to begin access to international and national information resources and networks.

We conclude by suggesting that this on-going program could rather cheaply provide a pilot test case on the applicability, and impact of information technology on field extension programs. It is estimated that the cost of providing each IPPM project field extension staff and program staff (approximately 25 sites) with the appropriate desktop computer, modem, printer, and email account would be just under US$50,000. This would provide a unique case test in Africa on the potential impact for computer based information for IPM development.